American Burn Association
Occupational Therapy and Physical Therapy
Special Interest Group

Scar Biology for Therapists &
Clinical Rehabilitation of Facial Burns

41st Annual Meeting
San Antonio, TX
Tuesday, March 24, 2009
MEETING AGENDA

American Burn Association
OT/PT Special Interest Group
Tuesday, March 24, 2009
Texas Ballroom D - Grand Hyatt

8:00 Welcome Jonathan Niszczak, MS, OTR/L
8:00 - 8:25 Business Meeting
   Membership Advisory Committee (MAC) Update Ingrid Parry, MS, PT
   Announcements
   Abstract & Manuscript Submission Updates Reg Richard, MS, PT
   Burntherapist.com Updates Jonathan Niszczak, MS, OTR/L
   Barbara Knothe Burn Therapist Achievement Award

LECTURE: Scar Biology for Therapists

8:25 – 8:30 Introduction of Bernadette Nedelec, BSc OT (c) erg. PhD Lisa Forbes-Duchart, MSc, OT Reg
8:30 – 9:15 Scar Biology for Therapists Bernadette Nedelec, BSc OT (c) erg. PhD
   Brief question/answer opportunity following lecture

9:15 – 9:30 Break Refreshments provided by Bio-Concepts, Inc.

WORKSHOP: Clinical Rehabilitation of Facial Burns

9:30 – 11:45 Small Group Break Out Session with Hands on Clinical Instruction:
   15-20 minute presentation at each of the following stations. Each attendee will rotate thru each
   station:
   Sculpting and Modifying the Positive Mold Beth Franzen, OTR
   Materials Used In the Treatment of Facial Scarring Sara-Jane Milne OT Reg
   Sheryle Marshall OT Reg
   Gail McMillan-Law OT Reg
   Harness & Strapping Systems Ingrid Parry, MS, PT
   Facial Scanning Technology Beth Costa, OTR
   Image Enhancement & Color Techniques Lisa Forbes-Duchart, MSc, OT Reg
   Linda Bailes OT Reg

11:45 – 12:00 Final Wrap Up and Closure for 2009 Meeting

* Bound Handout sponsored by Bio Med Sciences, Inc.
MEMBERSHIP ADVISORY COMMITTEE

The Membership Advisory Committee (MAC) committee is comprised of dedicated non-physician burn care professionals who serve the ABA in a variety of ways. It is the responsibility of all MAC members to facilitate the appropriate expression of concerns, questions, issues, needs and recommendations that the At-Large Members wish to bring before the Board of Trustees. Members of the MAC Committee attend each of the SIG meetings at the annual meeting in order to disseminate information regarding the ABA activities and general ABA information and opportunities.

SPECIAL INTEREST GROUPS

Background

Special Interest Groups (SIGs) originated out of the expressed need of the ABA membership to have small, informal groups in which to link with others with similar interests in an effort to exchange ideas, network with colleagues, share information and problem-solve. As the ABA grew, so did the number of SIGs. By 2003, there were 18 SIGs ranging in size from 10 to over 300 individuals attending various SIG meetings in conjunction with the ABA Annual Meeting.

The Special Interest Groups (SIG) hold meetings in conjunction with the Annual Meeting of the ABA. These meetings provide an opportunity for exchange of ideas, networking with colleagues, and information sharing. All ABA meeting participants are encouraged to attend these meetings, which are scheduled at times that do not conflict with the general meeting. These meetings are open to both members and nonmembers of the ABA.

Occupational Therapy / Physical Therapy (OT/PT)

This SIG provides opportunities for professional exchange of ideas, with colleagues on new treatment methods, research activity and clinical problem solving. Another focus is to encourage burn therapist involvement in the ABA.

2009 Chair: Jonathan Niszczak, MS, OTR/L
2009 Co-Chair: Daphne Parry,
2009 Co-Chair: Lisa Forbes-Duchart, MSc, OT Reg
The BurnTherapist.com web site - is the first site dedicated to the work and endeavors of Burn Occupational & Physical Therapists in an effort to develop outcome based research and clinical improvements for all burn survivors. We are committed to fostering collaborative networking relationships among burn therapists as well as developing clinical research, treatment innovations and improvement in service delivery and care at local, national and international levels.

We also highlight the achievements of Burn Occupational & Physical Therapists as part of the American Burn Association's Occupational & Physical Therapist Special Interest Group through the yearly Barbara Knothe Burn Therapist Achievement Award. We are a resource for therapist driven research and collaboration to provide the best treatment outcomes for the patients that we serve.

New Updates:
**Burn Engine (October 2006)**

Bernadette Nedelec BSc OT (c) erg. PhD, Assistant Professor, McGill University, and her team have created a discussion forum to allow OTs and PTs to be able to 1) post topics of interest and get feedback, 2) to be able to have discussions surrounding topics that other therapists may be interested in, or 3) simply to post information that may be interesting to other forum members. This site has been open to Canadian OTs and PTs for a while and now it is being extended to the USA and it will also regularly highlight peer-reviewed articles providing evidence to support burn survivor rehabilitation. If any OTs or PTs want to register as a member of the discussion forum all they need to do is to go to the web site and follow the link through the registration process.

This site is another free opportunity for all burn therapists to network and collaborate on operations and research related to burn rehabilitation. Thanks again to Bernadette and her team for organizing this site and allowing all of us to be involved.

**Burn Clinical Pearls (formerly Splinting Quarterly)**

Each Quarter (January, April, July & October) we will highlight a splinting endeavor that has been created to work with a challenging surgical intervention or as a result of a unique patient need or request. New designs as well as modifications to an existing, established design are welcomed. Post-operative splints as well as adaptive device splints, casting and any other type of ADL modification gladly are welcome. We will also be archiving all of the submissions so that we can maintain a resource of burn splinting knowledge. Contribute to the accumulated knowledge and submit your splint design to today!

Go to the web site www.burntherapist.com and get involved!
Linda and Tonas have a combined 48 years of Physical Therapy knowledge and practical experience working in a variety of different burn hospital and educational settings. They have been active members of both the APTA and ABA since 1986 and have contributed as educators, authors and instructors in multiple formats throughout their careers in the burn community on both the local and national scale. Most notably, in 1991 they were co-authors of a published manuscript which challenged the fundamental practice of 10 day immobilization following skin grafting to the lower extremities which led the way to the currently practiced much shorter time frames that we employ in burn practice today. However, this inseparable duo has served their biggest contribution to the burn rehabilitation community through their work with adolescent burn camps.

Linda and Tonas expanded their depth of burn camp experiences to become Co-Directors of the Mid-Atlantic Burn Camp Fund Incorporated, as the current President and Secretary-Treasurer respectively. They established this tax-exempt organization that hosts an annual week-long therapeutic summer camp. This “two of a kind” therapist team are responsible for recruitment and supervision of a staff of more than 50 volunteers and have coordinated burn unit liaisons and fund raising activities which has grown to an annual budget in excess of $100,000. Additionally, both have been moderators and speakers at several ABA Burn Camp Workshops and in 1995, they assumed and continue to currently hold the position of Co-Directors of the National Fire Fighters Children's Burn Camp.

They have served these multi-faceted positions for the past 17 years in addition to maintaining daily employment - Linda is a Physical Therapist at the Johns Hopkins – Howard County General Hospital for acute care and outpatient therapy with the Center for Wound Healing and Tonas is a Faculty Instructor and Academic Coordinator of Clinical Education at the University Of Maryland School Of Medicine. Linda and Tonas effortlessly maintain their longstanding presence in burn rehabilitation and their contributions to the children that they serve are perpetuated by their selfless examples and teachings.
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Scar Biology for Therapists & Clinical Rehabilitation of Facial Burns

The successful management of scars continues to be the core of what the burn therapist strives to minimize, and when possible inhibit, when providing rehabilitation and treatment to their patients. Critical to this management is a comprehensive understanding of how the scar develops and reacts to treatment. This year the OT/PT SIG will provide a two part approach to the meeting incorporating both a lecture and workshop. A lecture on “Scar Biology for Therapists” will address the clinical rationale and biological science of scars in a manner that is geared directly to the therapist providing treatment. A subsequent hands-on workshop “Clinical Rehabilitation of Facial Scars” will provide clinical reviews and small group breakout sessions to address specific treatment parameters related to the management of facial burns led by experienced burn therapists.

Speakers/Objectives:

LECTURE PROGRAM – SCAR BIOLOGY FOR THERAPISTS

Speaker: Bernadette Nedelec BSc OT (c) erg. PhD
Title: “Scar Biology for Therapists”
Objectives: At the conclusion of this presentation, the participants will be able to:

1) Understand the biological components of scars
2) Have a review of the current research that relates to practical scar management
3) Gain insight into the underlying scar physiology and how it reacts to treatment
4) Develop understanding of the current evaluation of scars for research v. clinical assessment

WORKSHOP PROGRAM – CLINICAL REHABILITATION OF FACIAL BURNS

Speaker: Beth Franzen OTR
Title: “Sculpting and Modifying the Positive Mold”
Objectives: At the conclusion of this presentation, participants will be able to:

1) Develop a clinical understanding of sculpting the facial mold to increase tissue length/contour and compress hypertrophic scar.
2) Identify current practical techniques to enhance the fit and function of the facial mask.

Speaker: Sara-Jane Milne OT & Sheryle Marshall OT & Gail McMillan-Law OT
Title: “Materials Used in the Facial Orthotic”
Objectives: At the conclusion of this presentation, participants will be able to:

1) Identify various appliances and materials used in the treatment of facial burn scars
2) Identify and examine the rational and factors associated with each type of material and choice and option.
Speaker: Ingrid Parry, M S PT  
Title: “Harness & Strapping Systems”  
Objectives: At the conclusion of this presentation, participants will be able to:

1) Identify multiple methods that can be used to anchor facial orthosis.
2) Understand how the design of the harness can impact function and fit of the mask.

Speaker: Beth Costa OTR  
Title: “Facial Scanning Technology”  
Objectives: At the conclusion of this presentation, participants will be able to:

1) Gain insight into the future of facial scanning and enhancements using this technology
2) Understand how these systems will impact current practice and treatment

Speaker: Lisa Forbes Duchart, M Sc, OT Reg & Linda Bailes OT Reg  
Title: “Image Enhancement & Color Techniques”  
Objectives: At the conclusion of this presentation, participants will be able to:

1) Describe the benefits of creative cosmetic techniques to improve self image and social reintegration
2) Implement practical behavioral strategies for assisting burn survivors to handle social challenges
Scar Biology for Therapists:
By Bernadette Nedelec, BSc OT (c) erg. PhD
Although a detailed review of the normal wound healing process, hypertrophic scar (HSc) pathophysiology, and the mechanism of treatment efficacy is beyond the scope of this presentation the central events in wound healing that may specifically contribute to HSc formation, and may be regulated by treatments prescribed by occupational and physical therapists will be highlighted. Those interested in more details are encouraged to read the highlighted (***) references.

Introduction

Following dermal injury, mammals lack the ability to regenerate skin; rather, under ideal conditions they form a “normal scar”, which provides the advantage of wound closure but is functionally inferior to normal skin (19). Unfortunately, wound-healing may result in overabundant scarring referred to as HSc or keloids. Hypertrophic scars occur in approximately 28 to 68% of the population after surgical incisions (15, 25, 32, 36), and in 33 to 91% after burns, depending upon the depth of the injury and time to wound closure (13, 25). Because of the magnitude of burn injuries, burn scars are larger in surface area and more serious when they reach their peak of severity than surgical scars (25). Not only does HSc produce non-pliable, erythematous, thickened scars that may be hyper- or hypo-pigmented, which are often times itchy and/or painful, they are also associated with significant cosmetic and functional morbidity and reduced quality of life (8, 16, 24).

The normal wound healing process includes 3 overlapping phases: 1) inflammatory, 2) regenerative, and 3) remodeling phases. During each phase, specific events predominate, which in turn set the stage for future events. Thus, each event and phase is critical for optimal wound repair to occur, but it is also critical that the duration and intensity of these events be limited and organized so that normal scar, rather than HSc is formed.

Inflammatory Phase

During the inflammatory phase excessive blood loss is prevented by the formation of a blood clot, which subsequently acts as a provisional matrix and provides the necessary signals for cell recruitment and proliferation in the form of cytokines and chemokines. Platelet activation and degranulation is responsible for the release of factor V, critical in clot formation and an array of critical cytokines such as transforming growth factor-beta (TGF-β), platelet-derived growth factor (PDGF), interleukin-1 (IL-1), tumor necrosis factor-alpha (TNF-α), insulin-like growth factor-1 (IGF-1), basic fibroblast growth factor-2 (FGF-2), which play a role in attracting macrophages, neutrophils, lymphocytes and mast cells to the region. As these cells move into the wound they further amplify the inflammatory response, begin to clean the wound through phagocytosis, initiate the process of extracellular matrix (ECM) deposition and release additional cytokines that attract fibroblasts, epithelial cells and endothelial cells, all of which are required for the regenerative phase (52).

Although these events are critical for optimal wound healing, an exaggerated or sustained response is thought to be one of the potential contributing factors to HSc formation. At one time it was believed that exuberant inflammation was “the” cause of fibrotic disorders but the failure of anti-inflammatory therapies has forced this theory to be revisited (4). However, there does appear to be some important difference during the inflammatory phase of wounds that proceed to normal scar versus
those that proceed to HSc. Platelet production of fibronectin provides a scaffold for the migration of cells necessary for the regenerative phase, but deposition continues to be high in HSc for month or years after that which is seen in the normal scar. Higher levels of PDGF production (released by both platelets and macrophages, with macrophages being are more numerous in HSc) may also be involved in HSc formation. PDGF has been shown to increase fibroblast proliferation, increase ECM production, and induce the myofibroblast phenotype (4, 52).

The T lymphocytes, specifically the CD4+ T helper cells, that are recruited into the wound fall into 2 general categories: T helper-1 (Th1) or T helper-2 (Th2). These are of particular interest in fibrotic disorders since the characteristics of Th2 cells (production of IL-4, decrease concentration of nitric oxide and nitric oxide synthase, stimulation of collagen and fibronectin production) promotes fibrosis, whereas Th1 attenuates it. There is systemic and local evidence that burn survivors and HSc formers favor a Th2 profile which may contribute to their scar formation (4).

Fibrocytes are also, potentially, a very important cell type in the formation of HSc. Fibrocytes are a sub-population of peripheral blood cells that produce cytokines, angiogenic factors, matrix metalloproteinases (MMPs), and connective tissue proteins such as collagen (9). Once fibrocytes have been recruited to the wound site they increase fibroblast collagen production and migration, they promote endothelial cell proliferation, migration, and tube formation, and they differentiate into myofibroblasts through $\alpha$-smooth muscle expression. Burn survivors have been shown to have increased numbers of circulating fibrocytes, which continues to be elevated for up to a year with injuries >30% TBSA and correlates with elevated systemic TGF-$\beta$ levels. Fibrocytes isolated from burn survivors have been shown to produce elevated levels of TGF-$\beta$ and connective tissue growth factor (CTGF) and phenotypically favor a Th2 response. HSc tissue has been shown to have increased numbers of fibrocytes relative to mature scar and normal skin (53), which may be the result of a lack of fibrocyte (myofibroblast) apoptosis in HSc (26, 29).

**Regenerative Phase**

The regenerative phase begins when fibroblasts, endothelial cells, and epithelial cells migrate into the provisional matrix after receiving the appropriate signals from the inflammatory cells (52). The transformation of the fibrin clot into granulation tissue requires a balanced degradation of the provisional matrix, synthesis of new ECM proteins and cell proliferation. Epithelial cells are responsible for resurfacing the wound, endothelial cells for creating a new capillary network and fibroblasts for ECM production including collagen, proteoglycans and glycosaminoglycans.

He clinical characteristics that define HSc (increased thickness, decreased pliability, increased erythema, increased itch) are the consequence of an exaggerated regenerative response that does not down regulate itself and go through the same remodeling and re-organization that is seen in normal scar. Collagen production is stimulated by a number of growth factors. The thickness of scar is partially a function of increased collagen production, but interestingly the amount of collagen, on a per unit basis, does not substantially differ in humans from normal scar and normal skin (46). A similar finding was demonstrated in a mouse model that developed HSc after an incisional wound was distracted or mechanically loaded (1). Collagen is however, less organized into the macrostructure that is characteristic of normal skin where collagen assembles into large fibres and fibre bundles in a basket weave pattern rather than thin, randomly oriented fibrils seen in HSc. The proportion of glycosaminoglycans and proteoglycans such as versican and biglycan, conversely are markedly increased (46). These ECM proteins contribute to the bulk of scar as they are hydrophilic thereby attracting large amounts of water which results in a thick, rigid scar.
New vessel formation is required for wound healing to occur but ultimately regresses as the scar matures. Although erythema is often times referred as the defining feature of HSc it is also commonly seen in donor sites that do not become hypertrophic (33). More precisely erythema suggests that vascular regression is ongoing and thus, the scar is still “active”. Unfortunately information about the role of the microvasculature in HSc is limited and seemingly contradictory. It has been demonstrated that there is a 25% reduction in pO2 levels in HSc compared with normal skin when measured directly (48) and that the vessels are less patent in HSc than normal skin and normal scar (47). These findings provide the support for the theory that hypoxia contributes to the formation of HSc (23). Yet laser Doppler measurements have repeatedly demonstrated that HSc perfusion is higher than normal scar and normal skin (30, 37, 50). Consistent with these findings a more recent study showed that the number of vessels in both the papillary and reticular dermis was higher in HSc than normal skin and the vessels in the papillary dermis were more dilated (2). Although these findings seem inconsistent there may be regions of hypoxia, induced by disturbed oxygen diffusion, caused by thickened endothelial vessel walls (23) or excessive ECM accumulation (2) since the rate of perfusion does not necessarily correlate with tissue oxygenation.

Epithelial cell/fibroblast cross-talk is an important regulatory event during the regenerative phase that has been implicated in the formation of HSc. The clinical observation that wound which take longer than 21 days to re-epithelize are more likely to form HSc (13) emphasizes that re-epithelization is an important event for the formation of normal scar. Epithelial cells begin to migrate and proliferate after being activated by a number of growth factors (52) secreted by fibroblasts, macrophages and mast cells. In turn, activated epithelial cells secrete growth factors that result in fibroblast and endothelial cell proliferation, provides signals that perpetuates their own proliferation and migration (52), increases fibroblast collagenase production (18), and is associated with increased wound contraction (21). Once epithelial cell migration and proliferation is complete TGF-β expressed by fibroblasts inactivates them and they reciprocally decrease collagen production by fibroblasts (52).

Any disconnect in the epithelial cell/fibroblast cross-talk may contribute to the formation of HSc. Epithelial cells isolated from HSc have increased proliferation and altered differentiation which results in them remaining in an activated state. This activated state resulted in reduced IL-1 and increased PDGF expression, which in turn may increase collagen production by fibroblasts (52). In an experimental reconstructed human skin model HSc epithelial cells resulted in thicker neodermis production due to increased fibroblast proliferation, collagen synthesis and decreased collagenase production. HSc epithelial cells were also associated with an increased number of myofibroblasts, particularly in the region close to the HSc epithelial cells (5).

Investigation of the role of TGF-β in wound healing has established that it plays a broad and important role. As such it also may play a pivotal row in the formation of HSc (4). It is secreted by platelets, macrophages, mast cells, fibrocytes, myofibroblasts, and fibroblasts. If present in its active form and optimal concentration it increases fibroblast and myofibroblast proliferation, is a chemoattractant for macrophages and fibroblasts, decreases epithelial cell proliferation, increases angiogenesis, increases ECM deposition and decreases collagenase activity. Considering the multiplicity of functions this growth factor has, if its presence, timing, and/or concentration are not optimally regulated it may contribute to fibrosis, thus has been implicated in many studies investigating HSc pathology. Recent evidence has demonstrated that CTGF may mediate many of the effects of TGF-β on fibroblasts (28) with HSc fibroblasts expressing higher CTGF levels (20-fold) than normal fibroblasts and exhibiting an exaggerated (150-fold) response to TGF-β1 stimulation (11).
Remodeling Phase

The remodeling phase in normal wound healing is characterized by a reduction in fibroblast and myofibroblast cell number, ECM re-organization including maturation of collagen architecture and normalization of proteoglycans and glycosaminoglycans levels, and vascular regression similar to that seen in normal skin.

The consequences of a lack of communication between the epithelial cells and fibroblasts during their cross-talk, which should set the stage for reduced ECM production and decreased numbers of fibroblasts and myofibroblasts, has already been discussed.

Another important mechanism by which the cell number is reduced is through apoptosis, which is a programmed cell death (20). Although the role of apoptosis in HSc formation is difficult to investigate directly, it has been demonstrated that apoptotic cell death increases with time in HSc (34) suggesting that it is an important mechanism by which the cell number is normalized. It may be that HSc fibroblasts and/or myofibroblasts are apoptotic resistant (24, 26), delaying the programmed cells death to weeks or months, rather than approximately 25 days, which is the peak seen in normal wound healing (14). It has also been demonstrated that apoptosis is accelerated when a viable graft is applied to an open wound (17), which may explain the reduced occurrence of HSc that is seen when autografts are applied. It was also demonstrated that mechanical distraction or loading of an incisional wound in mice initiates HSc formation through a decrease in cellular apoptosis (1).

The reorganization of collagen in HSc is likely influenced by the reduced concentration of decorin (45, 46) and an increased concentration of type III collagen (55). Decorin is involved in collagen fibril morphology and the lateral association of fibrils to form fibres and fibre-bundles (46) as is type III collagen (54). More recently decorin has been shown to inhibit cell proliferation and down-regulated TGF-β production by HSc fibroblasts and reduce collagen production (55). The normalization of proteoglycans and glycosaminoglycans levels (46) is also associated with scar maturation, which will result in a reduction in thickness and increase in pliability. The reorganization and normalization of ECM proteins requires their breakdown by proteases such as collagenase and other MMPs. These proteases have been shown to be reduced in HSc thereby favoring the accumulation of tissue and scar thickening (52).

In summary, if the messages sent (cytokines, growth factors, chemoattractants, chemokines) are too little (i.e. IL-1) or too much (i.e. TGF-β), this can result in too many (i.e. fibroblasts) or too few cells (i.e. epithelial cells) that then may produce too much (i.e. versican) or too little (i.e. decorin) ECM proteins and too little proteases (i.e. collagenase) activity. This spatiotemporal disorganization also results in ECM disorganization, leaving us (i.e. burn therapists) with the need to find treatments for the HSc that is produced.

Gel Therapy

The mechanism of action of gel therapy in scar management is still under debate. However, several suggested mechanism that have supporting evidence are that the skin surface temperature increases, which can significantly increase collagenase activity, and that there is a decrease in water evaporation and an increase in hydration of the stratum corneum (31). This later benefit may act upon the epithelial cell/fibroblast cross-talk by inhibiting fibroblast proliferation and ECM production (35, 49). These hypothesized mechanisms of action are consistent with clinical findings that have shown that some silicone-based creams and non-silicone gel sheets were equally as effective as silicone gel sheets since the occlusive properties are what appears to be most critical (31). It also provides a rational explanation for studies where occlusive products were not found to be effective (38, 44) since products that provide too little or too much occlusion are less effective (31).
Pressure Therapy

Although a meta-analysis of clinical studies evaluating the effectiveness of pressure therapy for the treatment of scars concluded there was a lack of evidence substantiating their benefits (3), a reduction in thickness of scars treated preventatively has been demonstrated when 15 mm Hg pressure was applied (51). Experimentally pressure or mechanical compression has been shown to increase prostaglandin E2 release (39), which may reduce fibroblast proliferation and collagen synthesis. In addition, mechanical compression increases protease expression (40, 42), which may have a beneficial impact on scar remodelling and induces apoptosis (41). Using a different experimental model where atmospheric pressure was elevated it was demonstrated that the proliferation rate and TGF-β production of HSc fibroblasts was reduced when treated for longer time periods (18 hrs versus 12 hrs) and with higher pressure (40 mm Hg versus 20 mm Hg)(10). Histological examination of scars treated with pressure revealed a normalization of collagen organization, as well as other ECM structures, a disappearance of nodular structures, and a reduction in myofibroblasts, probably through apoptosis (12). Theoretically these benefits may be attributed to hypoxia leading to an induction of fibroblast death, increased collagenase and other MMP activity, or mechanical forces inducing modification in ECM organization and composition (4, 7, 12).

Other treatment interventions that theoretically also apply mechanical forces such as inserts and orthoses presumably have similar benefits through the same mechanisms, however, there has been very little clinical research substantiating their benefit. Hwang and colleagues (22), in an uncontrolled study, were able to demonstrate an improvement in the web space angle after the application of web space inserts, although they did not return to normal values. Some evidence also exists for the benefit of orthoses (43, 6), but randomized controlled trials are lacking. However, if the search is extended beyond the burn literature there is moderate evidence that the application of orthoses (splint or serial casts) results in increased joint range of motion (27).

Summary

Normal wound healing is a complex process of overlapping, interconnecting events and factors that require “just right” timing and intensity to ensure the formation of normal scar. The formation of HSc, is therefore, equally as complicated and challenging to understand. Thus far, there has been a profound lack of research attention paid to treatment issues and those studies that have been conducted often times lack adequate methodological rigor (use of insensitive or inappropriate measurement instruments, insufficient numbers, inadequate follow-up, lack of randomized, controlled trials etc.). Thus, the optimal treatment of scar has yet to be defined, but is likely to require a multimodal approach with “just right” timing and dosage.
References

11) Colwell AS Phan TT Kong W et al Hypertrophic scar fibroblasts have increased connective tissue growth factor expression after transforming growth factor-beta stimulation. Plast Reconstr Surg 116:1387-1390, 2005


56) Zhang Z Li XJ Liu Y et al. Recombinant human decorin inhibits cell proliferation and downregulates TGF-β1 production in hypertrophic scar fibroblasts. 33:634-41, 2007
Sculpting and Modifying the Positive Mold
By Beth Franzen, OTR
Revising the Face Mask
A Continual Process

Beth Franzen, OT

A Lost Art

- With the use of surface scanning techniques, therapists are not always involved in the process of taking a model of the patient’s face or fabricating the face mask.
- Skills involved in ‘fitting’ the face mask may not be taught.
- Masks may be initially revised to contact scars or for comfort, but are not continually revised as the skin matures.

Frequent face mask revision

- It is important to revise face masks throughout the course of skin maturation
Wound healing

- Hypertrophic scarring
- Contractures of the face which can cause deformities e.g. ectropion of eyelids, lip eversion, loss of normal facial contours and other contractures.

Hypertrophic scar

![Hypertrophic scar image]

Contracture - ectropion

![Contracture - ectropion images]
Contracture – lip eversion

Contracture – medial canthus

When to begin wearing face mask

- Day 5 or when grafts are durable
- OK if there are small open areas
  - Use thin, moist dressing over open areas e.g. xeroform, Vaseline gauze, zinc oxide gauze
Schedule for new grafts

- Day 1: 1 hour on, 1 hour off continuously throughout the day; off at night.
- Day 2: 2 hours on, 1 hour off continuously throughout the day; off at night.
- Day 3: 3 hours on, 1 hour off continuously throughout the day; off at night.
- Day 4: Full time during day and begin at night full time, if tolerated. Remove for face/mouth exercises, eating, hygiene, bath. Try to wear at least 20 hours/day.

Considerations for new face graft

- Take a new model within 1-2 weeks of first model if face edema subsides and fit of mask is poor.
- Create ‘bubble’ in the plastic over open areas if they are not healing.
- Use dressings and foam pads under straps over healing scalp donors.
- Fabricate more than one face mask to accommodate microstomia appliances/splints.

Pre-grafting and POD 4-5
Staples removed  
First face mask

Approximately 18 months later

Carving the model to manage hypertrophic scar

- Carve plaster model and heat plastic mask to compress scar tissue evenly.
- Scar should appear blanched and "flat"; its margins should blend into surrounding unburned skin when patient is wearing mask.
- Blanched skin should return to pink color under mask after 5-10 minutes.
- Continue to carve and revise mask until all scars are blanched.
Tools for carving plaster

- Wood carving tools
- Chisel
- Dental carving tools

Sanding the plaster

- After carving, use drywall screen to sand the model until it is smooth
- Heat the plastic using a heat gun to revise the mask, increasing pressure or contour

Hypertrophic scar
Case study 1
Admit photo and prior to grafting
Hypertrophic scar
Case study one

- First face mask and neck splint on day 5-6 post graft (this picture is taken later)

Hypertrophic scar
Case study 1 – releases due to noncompliance with face and neck splint at home

Hypertrophic scar
Case study 1
2 years and 5 months post injury
Hypertrophic scar
Case study 1
2 years and 5 months post injury

Hypertrophic scar
Case study 2
Prior to grafting

Models for face mask

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Hypertrophic scar
Case study 2
Healing graft
Face mask Day 5-6 post graft

Hypertrophic scar
Case study 2

Hypertrophic scar
Case study 2
2 years post injury – inconsistent wear
Hypertrophic scar
Case study 2
2 years post injury - inconsistent wear

Hypertrophic scar
Case study 2

Hypertrophic scar
Case study 3
Prior to grafting
Hypertrophic scar
Case study 3
2 years and 3 months post injury

Hypertrophic scar
Case study 3
2 years and 3 months post injury

Hypertrophic scar
Case study 3

Hypertrophic scar
Case study 3
Other considerations

- Take new model and make new face mask every 6 months for a growing child to follow jaw development/growth.
- Fit patient with retainer if teeth are at risk of moving due to pressure from the mask. Dentist will fabricate.
- Revise mask frequently initially, then 1X/month or less frequently until scars are mature.

Carving the model to manage facial contractures

- Carve the model and revise the mask to increase skin length
- “Bottom out the tissue to the underlying bony structure”
- Accentuate contours
- Create skin mobility and ability to convey full facial expression by adding skin length

Forehead

- Very little pressure needed
- Use head band to secure face mask or by itself as pressure
Eyes - contracture

- Ectropion
- Medial canthus
- Lateral canthus

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Eyes

- Ectropion
  - Face mask can help prevent or correct lower lid ectropion
  - Face mask should contact bony orbit around eye
  - Avoid contact directly onto eye

---

Eyes

- Medial canthus
  - Maintain length of skin along medial canthus
  - May need tools e.g. a pencil eraser to push plastic into this area on the model
Eyes

- Lateral canthus
- Maintain good contact along margin of graft at lateral canthus area

Lateral canthus

Nose - contracture

- Alar groove
- Nasolabial fold
- Sides of nose as they connect to the face
Nose - contracture

- Sides of nose

Nose - contracture

Nose/mouth contracture

- Nasolabial fold
Nasolabial fold - contracture

Mouth contractures
- Eversion of upper or lower lip
- Microstomia

Mouth contractures
- Eversion
  - Plastic should contact to
  - or slightly past the vermilion
  - Lengthen tissue between
    chin and lower lip by
carving a concave space
under lip
  - May need a retainer on
    teeth if mask presses
against teeth
### Overall face length
- Length of face between lower lid of eye and mandible (contracture leads to ectropion)
- Cervicomental angle “chin shelf”

### Length of face
- Can create length by carving under cheekbone

### Length of face
**Case study 1**
**Initial injury and homograft placement**
Case study 1
Integra placement

POD 5-8

Case study 1
First face mask and neck splint
POD 6-7
Case study 1
Releases to lower lids
Length of face
Case study 2
14 months post burn

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Length of face
Case study 2

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Face - jaw

- Cervicomental angle
- Keep increasing "chin shelf" – define angle of jaw by carving under mandible
Cervicomental angle
Case study 3

Surgical release 15 months after first surgery
Case study 3

Comparison pre and post surgical release
Case study 3
Comparison pre and post surgical release
Case study 3

Neck models comparison
Case study 3

Ears
- Can create ‘slot’ for ear to contact areas behind ear
Conclusion

- We want patients to put their best face forward.
- Best practice and outcome means skin that is soft and flat, as close to normal skin color as possible and pliable/able to convey expression and emotion.
- Continuing to fit and revise the face mask over time is the best way to achieve this goal.
Materials Used in the Treatment of Facial Scarring
By Sara-Jane Milne, OT Reg
OBJECTIVES

At the conclusion of this discussion, participants will be able to:

1) Identify various appliances and materials used in the treatment of facial burn scars.
2) Identify the rationale for use of each appliance and material type.
3) Identify advantages and disadvantages of each appliance and material choice.
4) Identify factors that must be considered when choosing and implementing a treatment approach.

INTRODUCTION

Facial burns pose considerable rehabilitation challenges (Housinger et al., 1994). The ultimate goal of your treatment is to provide the best aesthetic and functional outcome possible for your client. This is best achieved by early and aggressive treatment to prevent or minimize:

- Hypertrophic scar formation
- Facial asymmetry and disfigurement including loss of profile and nasal flattening (Ward et al., 1991)
- Contractures including eye or nose ectropia and oral microstomia (Walker, 2007)
- Pain and itchiness

CONSIDERATIONS FOR TREATMENT

The standard treatment for scar control in healed facial burns is the application of pressure by means of an elastic fabric mask, an elastic mask with silicone insert, or a transparent plastic face mask (Serghiou et al., 2004). However, there are also additional approaches and materials that can be used for management of facial scarring. No one technique provides a consistent and satisfactory result. Each has identified advantages and disadvantages; therefore many factors need to be considered when determining the best treatment choice for each individual client.

1) Anatomic location of the burn

- Tissue compliance: bony prominences such as the chin, soft tissue areas such as the cheeks
- Overall local geometry of the body parts ex) prominence of the nose
- Oral involvement
- Concave areas such as the inner canthus, paranasal areas, horizontal fold of the chin, and around the mouth.

2) Stage of Wound Healing

- Length of time post grafting/healing
- Open areas
- Established hypertrophic scarring

3) Size and Depth of Burn

- Level of risk for hypertrophic scarring
- Functional and aesthetic impact
- Option for surgical scar excision
4) **Age**

- Ability to tolerate fabrication and wearing of material or appliance
- Stage of skeletal growth
- Level of family support
- Developmental level

5) **Occupations**

- Work:
  1. Environmental conditions
  2. Job demands
- School
- Leisure activities

6) **Functional Capacity**

- Hand dexterity or decreased upper extremity ROM; particularly a consideration for burn survivors with severe hand/upper extremity burns, who are elderly, or who have pre-morbid disabilities such as arthritis.
- Cognitive impairment ex) Elderly people with mental health diagnoses or a developmental disability.

7) **Financial Considerations**

- Materials funded by institution
- Client or family financially responsible
- Insurance coverage

8) **Climate**

- Very hot or cold climates

9) **Microstomial splints being used**

10) **Availability of equipment, materials, and therapist expertise**

11) **Client/family cooperation and overall compliance level**

**PRESSURE THERAPY**

1) **History:**

- Pressure therapy has been used for nearly 200 years and is currently the most widely used method to help minimize hypertrophic scarring resulting from burns (Bombaro et al., 2003; Carr-Collins, 1992; Leung & Ng, 1980; Linares et al., 1993; Serghiou et al., 2004; Williams et al., 1998).

2) **Mechanism of Action:**

- The exact mechanism of pressure therapy is unknown, but the most widely accepted theory is that pressure on a healing burn scar increases the maturation rate of the scar, decreases the vascularization, controls local edema, promotes the alignment of collagen fibres, and minimizes the overgrowth of the area by limiting the supply of oxygen, thereby providing a more acceptable cosmetic and functional outcome (Baur et al., 1976; Hambleton et al., 1992; Kischer et al., 1975; Leung & Ng, 1980).
3) Pressure Required For Optimal Treatment

- The optimal level of pressure required remains controversial and an exact pressure has never been scientifically proven (Cheng et al., 1984; Mann et al., 1997; Van den Kerckhove et al., 2001).

- Theoretically, an appliance must exert >24 mmHg pressure to overcome capillary pressure and decrease the vascularization to the scar, causing visible blanching (Baur et al., 1976; Cheng et al., 1984; Leung et al., 1984; Van den Kerckhove et al., 2001; Ward, 1991). However, some authors have shown positive results with pressures between 5-15 mmHg (Cheng et al., 1984; Macintyre & Baird, 2006; Reid et al., 1987; Ward, 1991). Pressures above 30-40 mmHg may cause discomfort and are potentially harmful to the client (Fricke et al., 1999; Leung et al., 1984; Macintyre & Baird, 2006; Reid et al., 1987).

- Applied pressure obeys the LaPlace law, which in the context of pressure garments is proportional to the fabric tension and inversely proportional to the circumference (p = T/C). The larger the diameter or radius, the lower the pressure. Concave areas are not as well pressed and areas with significant soft parts have lower pressure. Pressure will thus vary according to the areas where it is applied (Leung et al., 1984; Roques, 2002).

- Most therapists agree that pressure must be applied on a 24 hour basis, with removal only for bathing, exercise, and activities of daily living such as eating, oral care, and facial hygiene (Serghiou et al., 2004).

4) Methods of Pressure Therapy Used On Facial Burns

A. Flexible Pressure Therapy: Fabric Pressure Garments

- Made from fabrics having an elastic component that exerts pressure on the body because the garment is smaller than the body to which it is fitted (Macintyre & Baird, 2006). Available in ready made and custom varieties.

- Ideally should be applied as soon as epithelialization has occurred and worn until scar reaches maturity (Leung & Ng, 1980; Ward et al., 1991).
### PRESSURE GARMENTS

<table>
<thead>
<tr>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Allow freedom of movement of the face making functional activities such as speech, feeding, and oral hygiene possible while wearing (Ward et al., 1991)</td>
<td>○ Pressure is difficult to apply evenly and maintain across the face particularly in concave areas (Groce et al., 1999; Powell et al., 1985; Shons et al., 1980; Ward et al., 1991)</td>
</tr>
<tr>
<td>○ Effectively apply pressure to broad areas of the face such as the forehead and lateral cheek areas (Shons et al., 1981)</td>
<td>○ Clear tendency for loss of pressure after as little as one month of wear (Cheng et al., 1984; Van den Kerckhove et al., 2006)</td>
</tr>
<tr>
<td>○ Difficult for young children to remove in comparison to TFO</td>
<td>○ May cause developmental impairment of skeletal growth in children due to high pressures generated at the tip of the chin (Fricke et al., 1996; Leung et al., 1984)</td>
</tr>
<tr>
<td>○ More comfortable for sleeping in</td>
<td>○ Pressure applied to the developing facial structures may alter the position of the teeth. Risk is increased with simultaneous use of a neck splint (Fricke et al., 1996)</td>
</tr>
<tr>
<td>○ Can insert microstomial splints while wearing</td>
<td>○ Risk for skeletal or dental deformations in adults with previous facial surgery, trauma, or orthodontic treatment (Silfen et al., 2001)</td>
</tr>
<tr>
<td>○ Relatively non-invasive measurement and application process</td>
<td>○ May cause blistering, abrasion and ulceration of scar tissue due to friction or shearing forces caused by donning/doffing garment (Carr-Collins, 1992; Leung et al., 1984; Roques, 2002; Stewart et al, 2000)</td>
</tr>
<tr>
<td>○ Soft fabric linings can be inserted over fragile scar areas to reduce friction and skin breakdown (Carr-Collins, 1992)</td>
<td>○ Require frequent remeasuring due to growth and/or loss of pressure</td>
</tr>
<tr>
<td>○ Pockets for additional padding or inserts can be sewn in areas where adequate pressure is not being achieved (Leung &amp; Ng, 1980; Cheng et al, 1984)</td>
<td>○ Patient non-compliance due to self-consciousness or lack of perceived benefits of improvement to scars (Hubbard et al., 2000; Stewart et al, 2000)</td>
</tr>
<tr>
<td>○ Can be fabricated with Cool Max® material (Medical Z) which assists with thermo-regulation and in wicking moisture away; increased comfort in hot climates and during exercise</td>
<td>○ Hide the face and create a sinister appearance which is increased by use of inserts (Powell et al, 1985) (See Figure 1)</td>
</tr>
<tr>
<td>○ Silicone bonded material such as Silon-TEX® (Bio-Concepts, Inc.) can be added as an insert for the combined benefit of pressure and silicone</td>
<td>○ Traditional materials may cause discomfort from heat and perspiration (Macintyre &amp; Baird, 2004; Stewart et al., 2000)</td>
</tr>
<tr>
<td>○ Difficult to apply; zippers and Velcro catch in hair (Powell et al, 1985)</td>
<td>○ May cause eczema, rashes, purities, and itchiness (Stewart et al, 2000)</td>
</tr>
<tr>
<td>○ Lack of uniformity in manufacturing process; identical garments made by the same manufacturer for the same person can fit differently and exert different pressures</td>
<td>○ Discomfort caused by seams and material that is stiff and rough in texture (Macintyre &amp; Baird, 2004)</td>
</tr>
<tr>
<td>○ May cause obstructive sleep apnea (OSA) in children who are already at risk for developing OSA (i.e. positive family history, severe neck flexion contractures, limited mouth or nasal opening) (Hubbard et al., 2000)</td>
<td>○ Difficult to apply; zippers and Velcro catch in hair (Powell et al, 1985)</td>
</tr>
<tr>
<td>○ Expensive</td>
<td>○ Lack of uniformity in manufacturing process; identical garments made by the same manufacturer for the same person can fit differently and exert different pressures</td>
</tr>
<tr>
<td>○ Pressure exerted is dependant upon accurate measurement of patient as well as accurate design and location of pockets (Carr-Collins, 1992)</td>
<td>○ May cause obstructive sleep apnea (OSA) in children who are already at risk for developing OSA (i.e. positive family history, severe neck flexion contractures, limited mouth or nasal opening) (Hubbard et al., 2000)</td>
</tr>
<tr>
<td>○ May be allergic to material, though this is rare (Roques, 2002)</td>
<td>○ Expensive</td>
</tr>
<tr>
<td>○ Observation of children becoming withdrawn and having loss of usual personality with application of hood and face mask (Groce et al., 1999)</td>
<td>○ May be allergic to material, though this is rare (Roques, 2002)</td>
</tr>
<tr>
<td>○ Increased anxiety exists among teachers and peers when children with burns re-enter school with a pressure garment mask and hood (Groce et al., 1999)</td>
<td>○ Observation of children becoming withdrawn and having loss of usual personality with application of hood and face mask (Groce et al., 1999)</td>
</tr>
<tr>
<td>○ Lack of quality controlled research and general disagreement regarding its efficacy (Bombaro et al., 2003; Mann et al., 1997; Van den Kerckhove et al, 2005)</td>
<td>○ Increased anxiety exists among teachers and peers when children with burns re-enter school with a pressure garment mask and hood (Groce et al., 1999)</td>
</tr>
</tbody>
</table>
B. Rigid Pressure: Transparent Facial or Chin Orthotics (TFO/TCO)

- Most therapists choose to use this treatment to provide scar management to the face (Parry et al., 2002; Serghiou et al., 2004).

- Typically initiated 2 weeks post grafting though has been applied successfully to the healing wound prior to complete epithelialization (Engrav et al., 1983; Serghiou et al., 2004; Shons et al., 1980)

- Can be made with one of two types of material (Allely et al., 2008):
  - A transparent high temperature copolymer thermoplastic material such as Vivak® (Sheffield Plastics) or Uvex (Almac Plastics)
  - Silon-STS® (Bio Med Sciences, Inc.): Vivak® with an adhered silicone contact liner.

- Advantages of using Silon-STS® material include:
  - Shown to decrease vascularity compared to non-silicone lined mask (Allely et al., 2004)
  - Excellent conformability, allowing greater contact of material to the scar, therefore maximizing scar compression
  - Silicone lining creates softer edges, requiring less time using a rotary tool
  - Silicone works without pressure; therefore ensuring treatment of areas where firm contact is not fully achieved or is undesirable.
  - The silicone lining softens the TFO and allows for improved patient comfort, increasing patient tolerance
  - Good durability – The material can be spot heated multiple times to increase conformity. The silicone layer lasts the life of the splint.
  - Both preferred scar treatments, pressure therapy and silicone gel, are incorporated into a single modality (Forbes-Duchart, 2007)
<table>
<thead>
<tr>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>o More aesthetically pleasing; do not have sinister appearance (Powell et al., 1985) (See Figure 1)</td>
<td>o Can be an invasive fabrication procedure if not completed by scanner; children or anxious adults may require general anesthesia. Facial relaxation and the endotracheal tube can distort the facial contours resulting in a less desirable mold (Powell et al., 1985)</td>
</tr>
<tr>
<td>o Improved compliance in comparison to fabric masks (Shons et al., 1980)</td>
<td>o Requires specialized equipment for heating material (convection oven or flat panel heater) and vacuum former (better result vs. hand pulling)</td>
</tr>
<tr>
<td>o Provides pressure to and maintains precise facial contours around the eyes, nose, mouth, and chin (Powell et al., 1985; Shons et al, 1980)</td>
<td>o Increased therapy time required: 6-10 hours (Parry et al., 2002)</td>
</tr>
<tr>
<td>o Stabilizes and maintains alignment of the nose</td>
<td>o Accurate fabrication and fitting is dependant upon an accurate mold and the skills of an experienced therapist; therapists report a need to recast the client for reasons other than growth (Parry et al, 2002)</td>
</tr>
<tr>
<td>o Durable</td>
<td>o Requires remolding as scar and/or client’s face changes due to growth and weight fluctuation</td>
</tr>
<tr>
<td>o Easy for older children and adults to apply</td>
<td>o Expensive: $51.00 – 100.00 US plus therapists time (Parry et al., 2002)</td>
</tr>
<tr>
<td>o Provides clients and therapists with visual feedback (blanching) so they can determine accurate mask placement/fit, see the effect of pressure, and determine the necessary tightness during application (Allely et al., 2008; Powell et al., 1985).</td>
<td>o Difficult to apply to young children; easy for them to remove</td>
</tr>
<tr>
<td>o Easy to clean with soap and water</td>
<td>o Patient non-compliance due to self-consciousness or lack of perceived benefits or improvement to scars</td>
</tr>
<tr>
<td>o Tolerated well by underlying healing tissues (Shons et al., 1980)</td>
<td>o Discomfort from heat and perspiration particularly in warm weather or during exercise</td>
</tr>
<tr>
<td>o Can modify by spot heating</td>
<td>o May be difficult/uncomfortable to sleep in</td>
</tr>
<tr>
<td>o Used by professional athletes for prevention of and protection of facial fractures; children and young adults may see as a role model (see Figure 2)</td>
<td>o May cause dermatitis or maceration (Shons et al, 1980)</td>
</tr>
<tr>
<td>o May cause dental deformities and developmental impairment of skeletal growth as per pressure garments (Fricke et al., 1996; Leung et al., 1984)</td>
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</tr>
<tr>
<td>o Skull deformations may occur dependant upon the anchoring systems used (Roques, 2002)</td>
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</tr>
<tr>
<td>o Blanching areas of hypertrophic scar achieved on application of the TFO are not usually sustained over time, possibly due to facial movements while talking, changing facial expression, etc. (Allely et al., 2008)</td>
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</tr>
<tr>
<td>o Impedes facial movement therefore impedes speech and must be removed to eat, complete oral hygiene, and insert microstomial splints (Ward et al., 1991)</td>
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</tr>
<tr>
<td>o Lack of scientific evidence regarding efficacy</td>
<td>o Lack of scientifically established guidelines for achieving effective pressure</td>
</tr>
</tbody>
</table>
C. Supplemental Pressure:

- Used within pressure garments or under TFO’s to supply supplemental pressure to concave areas where the garment or orthotic spans these sites. It acts to “fill the gap” and provide more definitive pressure to the scar (Carr-Collins, 1992). Commonly used materials, based upon writer’s experience and literature review, include:

  o **Velfoam®**: Used to fill strategically placed pockets within pressure garments.

  o **Elastomer Putty** such as Rolyan® 50/50 Mix Elastomer Putty (Smith and Nephew): A base putty that requires the addition of a catalyst to produce a flexible rubber like mold that can be used under garments or face masks. The catalyst paste is mixed into the base and the resultant mixture is smoothed into the low points of the scar using gentle pressure. Also available with a silicone base and catalyst ex) **Otoform K®** (Smith and Nephew) (Carr-Collins, 1992).

  o **Silicone Elastomers** such as Silastic® Medical Elastomer (Smith and Nephew): A closed cell liquid base, which is mixed with a catalyst silicone to produce a strong but flexible rubber like mold that can be used under garments or face masks for supplemental pressure and silicone treatment. Prior to application of the silicone, any open areas should be covered with a Vaseline impregnated gauze and healed areas lubricated with a water-soluble solution to aid in removal of the completed mold. It is applied in a liquid form to create an exact impression of the underlying scar surface. The mixture is either poured or spread over the scar using a tongue blade. The mold should not be >1/2 inch thick over the scar and should slope to about 1/8 inch at the sides to conform to the skin surrounding the scar. The amount of catalyst used will determine the time required for curing of the silicone (generally only a few minutes). To strengthen the interface, a single or double ply course mesh gauze may be imbedded into the silicone as it cures. Once the mold is firm and dry, it can be lifted from the face. (Carr-Collins, 1992; Malick & Carr, 1980)

  o **Silicone Gel Sheeting**: Can be used in conjunction with pressure garments or TFO’s for supplemental pressure with the added benefit of silicone. Please see section entitled “Silicone Gel Sheeting” for further detail.

  o **Silon-LTS® (Bio Med Sciences, Inc.):** A low temperature thermoplastic splinting material combined with a therapeutic silicone surface.
<table>
<thead>
<tr>
<th>Supplemental Pressure Insert</th>
<th><strong>Advantages</strong></th>
<th><strong>Disadvantages</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Velfoam®</strong></td>
<td>- Inexpensive</td>
<td>- Does not conform well to facial contours tending to span the concave area</td>
</tr>
<tr>
<td></td>
<td>- Easy to cut to size and insert under or into pockets within pressure garments</td>
<td>- Applies minimal amount of pressure</td>
</tr>
<tr>
<td></td>
<td>- Decreased risk for skin breakdown of a recently healed or grafted burn</td>
<td></td>
</tr>
<tr>
<td><strong>Elastomer Putty</strong> (Carr-Collins, 1992)</td>
<td>- Application is easily controlled making it ideal for small areas of scar</td>
<td>- Does not conform well to irregularly textured scars</td>
</tr>
<tr>
<td></td>
<td>- Easily and quickly molded on children</td>
<td>- Difficult to keep in place under garments</td>
</tr>
<tr>
<td></td>
<td>- Fills out concave areas for increased pressure</td>
<td>- Choking/ingestion risk to children</td>
</tr>
<tr>
<td></td>
<td>- Washable and can easily disinfect</td>
<td>- Can cause increased sweating and maceration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- May result in scar breakdown due to its occlusive nature if the targeted scar is fragile.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Molds require frequent replacement to accommodate the receding scar and maintain definitive contact with the scar surface.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Invasive and more lengthy molding process; children may be uncooperative.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Messy fabrication process</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Can not be used over open areas.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Choking/ingestion risk for children.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Can cause increased sweating and maceration</td>
</tr>
<tr>
<td><strong>Silicone Elastomer Putty</strong> (Carr-Collins, 1992)</td>
<td>- As per elastomer putty</td>
<td>- As per elastomer putty</td>
</tr>
<tr>
<td></td>
<td>- Combines advantages of pressure therapy with those of silicone therapy</td>
<td></td>
</tr>
<tr>
<td><strong>Silicone Elastomers</strong> (Carr-Collins, 1992; Malick &amp; Carr, 1980; Ward et al., 1991)</td>
<td>- Provides definitive pressure to scars with an irregular surface due to it’s ability to reproduce the topography of the scar</td>
<td>- May result in scar breakdown due to its occlusive nature if the targeted scar is fragile.</td>
</tr>
<tr>
<td></td>
<td>- Fills out concave areas for increased pressure</td>
<td>- Molds require frequent replacement to accommodate the receding scar and maintain definitive contact with the scar surface.</td>
</tr>
<tr>
<td></td>
<td>- Can be used in conjunction with low temperature thermoplastics, and under both garments and TFO’s</td>
<td>- Invasive and more lengthy molding process; children may be uncooperative.</td>
</tr>
<tr>
<td></td>
<td>- Combines advantages of pressure therapy with those of silicone therapy</td>
<td>- Messy fabrication process</td>
</tr>
<tr>
<td></td>
<td>- Resists oxidation and does not become hard with age</td>
<td>- Can not be used over open areas.</td>
</tr>
<tr>
<td></td>
<td>- Permits normal mobility of the face</td>
<td>- Choking/ingestion risk for children.</td>
</tr>
<tr>
<td></td>
<td>- Can be immersed in boiling water for 15 minutes to reduce odour</td>
<td>- Can cause increased sweating and maceration</td>
</tr>
<tr>
<td><strong>Silon-LTS®</strong> (Bio Med Sciences, Inc)</td>
<td>- Combined benefit of silicone and pressure</td>
<td></td>
</tr>
</tbody>
</table>
Figure 1: More aesthetically pleasing transparent facial orthotic vs. sinister appearing elastic pressure garment with silicone elastomer insert (Groce et al., 1999).

Figure 2: Richard “Rip” Hamilton wearing the “Rip” Mask, the same transparent facial orthotic worn by burn survivors.
SILICONE GEL PRODUCTS

1) Description:

- Silicone gel sheeting is a soft, semi occlusive and self-adhesive silicone sheet (Carr-Collins, 1992; Katz, 1995; Levier et al., 1993). Sheets may be applied directly over the burn scar without the use of pressure and can be worn daily for as long as 23 hours/day. A gradual increase in wearing time is recommended to allow the skin to adjust to the occlusive nature of the product.

- Topical silicone gel is composed of the same polymers as silicone gel sheeting but is available in a liquid gel form. A thin layer is applied to the scar daily with reapplication after facial cleansing or excessive sweating.

- Can not be applied over open wounds, placed in direct contact with mucous membranes or applied too close to the eyes.

2) History:

- Silicone products were first introduced for use under pressure garments as a method of increasing pressure to these concave areas (Malick & Carr, 1980), and experience has expanded for use without pressure garments. Self-adhesive silicone gel sheeting and topical silicone gel was initially used in the treatment of burn scars in the 1980’s (Van den Kerckhove et al., 2001).

3) Mechanism of Action:

- The exact working mechanism of silicone remains unknown. Today, the most widely accepted theory is that silicone gels work by means of occlusion, thereby decreasing the rate of evaporative water loss and increasing hydration of the burn scar. The increase in hydration is thought to decrease vascularity and inhibit fibroblast production thereby reducing collagen deposition and subsequent hypertrophic scar formation (Beranek, 1990; Chang et al., 2001; Davey et al., 1991; Katz, 1995; Quinn et al., 1987).

4) Effectiveness:

- There is a large degree of uncertainty as to the effectiveness of silicone in the treatment of hypertrophic scarring. Many of the existing studies have varying degrees of methodological limitations including lack of control groups, failure to discuss statistical procedures, and lack of an objective, reliable and valid outcome measure to evaluate scar parameters (Farquhar, 1992; Li-Tsang et al., 2006; O’Brien & Pandit, 2005).

- Several studies have found some evidence that silicone gels are effective in increasing pliability and in reducing the vascularity, pigmentation, thickness, pain and itchiness of hypertrophic scarring (Ahn et al., 1989; Borgognoni, 2002; Cruz-Korchin, 1996; Fulton, 1995; Gold, 1994; Li-Tsang et al., 2006; Perkins et al., 1983; Quinn et al., 1985; Quinn, 1987).

5) Advantages & Disadvantages of Commonly Used Silicone Products:

(Based upon writer’s experience and literature review)
<table>
<thead>
<tr>
<th>Silicone Product</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All Silicone Gel Sheeting</strong>&lt;br&gt;(Al-Mandeel et al., 1998; Chang &amp; Ries, 2001; Katz, 1995; Van den Kerckhove et al., 2001)</td>
<td>• Can be easily washed and reused up to 4 weeks&lt;br&gt;• Non-invasive and comfortable to apply&lt;br&gt;• Pliable and moves with the skin&lt;br&gt;• Breathable&lt;br&gt;• Can reduce existing scars in addition to helping in the prevention of scar&lt;br&gt;• Works without the use of pressure</td>
<td>• Can cause skin breakdown, puritis or rash&lt;br&gt;• Expensive&lt;br&gt;• Usefulness is limited to small areas&lt;br&gt;• Difficulty in adhering to concave areas and over facial hair&lt;br&gt;• Pressure garments are generally difficult to apply over silicone gel sheeting without causing the gel sheet to shift&lt;br&gt;• Tends to peel off with effect of gravity even with the use of tape&lt;br&gt;• Tendency to fragment over time&lt;br&gt;• Can not be applied over antibiotic skin treatments or products such as moisturizer</td>
</tr>
<tr>
<td><strong>Oleeva Foam®</strong>&lt;br&gt;(Bio Med Sciences, Inc)</td>
<td>• Increased thickness makes it useful for supplemental pressure over concave areas under a pressure garment</td>
<td>• Does not stay in place without the use of skin tape or a garment</td>
</tr>
<tr>
<td><strong>Oleeva Fabric®</strong>&lt;br&gt;(Bio Med Sciences, Inc)</td>
<td>• More likely to stay in place during clothing and garment application due to smooth and silky backing&lt;br&gt;• Less conspicuous due to thinness</td>
<td>• Likely to require skin tape or a garment to stay in place for longer amounts of time.</td>
</tr>
<tr>
<td><strong>Oleeva Clear®</strong>&lt;br&gt;(Bio Med Sciences, Inc)</td>
<td>• Very inconspicuous&lt;br&gt;• Reportedly, cosmetics can be applied over top</td>
<td>• Will not stay adherent overtime and is very likely to require skin tape to stay in place&lt;br&gt;• Very difficult to apply garments over top</td>
</tr>
<tr>
<td><strong>Cica Care®</strong>&lt;br&gt;(Smith &amp; Nephew)</td>
<td>• Increased thickness makes it useful for placement over concave areas under a pressure garment&lt;br&gt;• Very good adherence in comparison to other products available&lt;br&gt;• Most successful clinical outcomes noted by writer</td>
<td>• Less inconspicuous due to thickness and texture&lt;br&gt;• Over time may need additional fixation&lt;br&gt;• Not as durable in comparison to other products available</td>
</tr>
<tr>
<td><strong>Silon-SES®</strong>&lt;br&gt;(Bio Med Sciences)</td>
<td>• Durable enough to last up to several months, therefore more cost-effective&lt;br&gt;• Soft and compliant&lt;br&gt;• Less likely to fragment over time&lt;br&gt;• Easily washable&lt;br&gt;• Low profile minimizes complications with garment sizing</td>
<td>• Requires additional fixation</td>
</tr>
<tr>
<td><strong>Dermatix Topical Silicone Gel</strong></td>
<td>• Self drying and light weight&lt;br&gt;• Cosmetics can be applied over top of gel once dry&lt;br&gt;• Invisible</td>
<td>• May stain clothing if not completely dry&lt;br&gt;• May cause skin irritation&lt;br&gt;• Poor clinical results noted by writers</td>
</tr>
</tbody>
</table>
RECOMMENDATIONS FOR THE PEDIATRIC POPULATION

1) **School Re-entry Presentations:**
   - Children may fear or actually experience teasing, questions, and staring at school. School re-entry presentations to students and staff may be helpful to decrease the fear of the unknown and to provide a venue to explain burns, hypertrophic scarring, and the various treatment modalities including pressure garments, TFO’s, silicone therapy, etc.
   - Helpful Resource: “The Journey Back” (Phoenix Society for Burn Survivors)

RECOMMENDATIONS FOR THE PEDIATRIC & ADULT POPULATIONS

1) **Referral to Orthodontics:** Children should be followed by an orthodontist during and up to 2 years post pressure therapy to monitor facial growth and dental development and to provide intervention when necessary (Fricke et al., 1996). Adults with recent teeth extraction or previous facial trauma/surgery should be referred to an orthodontist prior to pressure garment application (Silfen et al., 2001). They may recommend a specialty intraoral device or splint, an alternate wearing schedule, or discharge of pressure therapy (Fricke et al., 1996; Roques, 2002; Shons et al., 1981).

2) **Community Re-entry Skills Training:** Education to clients and families re: how to respond effectively to staring, teasing, and questions. This can include age appropriate verbal discussion, books, videos, role playing, workbooks, etc.

3) **Image Enhancement Program**

4) **Psychosocial Support**
   - Appropriate referrals to psychiatry, social work, child life, etc.
   - Facilitation of individual peer support or group support

5) **Client Centred Care: Involve the Client and Family in Treatment Plan!**
   - Two-way versus one-way communication; speak *with vs. down to* your client.
   - Establish supportive client-therapist relationships aimed at empowering clients to assume active roles in their treatment and achieve a sense of control over their treatment outcomes. Allow them to make educated choices re: treatment preferences.
   - Identify the needs of each individual client re: information, support, and reinforcement required. Ensure that they have the necessary contact information for applicable team members.
   - Establish mutually agreed upon treatment goals that are consistent with the client’s beliefs, priorities, and life circumstances. Do not make assumptions.
   - Communicate at a level that the client and family can understand; ensure that an interpreter is available if a language barrier present. Ask them if they understand!
   - Offer a consistent, concerned and non-judgmental atmosphere: they will be more likely to tell you why they aren’t wearing the face mask or pressure garment and it may be something that you are able to modify or assist with. (Stewart et al., 2000)

6) **Interactive Education of the Client and their Family/Caregivers**
   - Why is treatment needed? What is hypertrophic scarring?
   - Clear identification of treatment options including:
     i. Rationale for treatment
     ii. Risks and benefits of each
     iii. Financial cost of each if applicable
   - Clear instructions for wear and care of appliance/material
   - Consequences of non-compliance with treatment
   - Importance of attending follow-up appointments
   - Use a variety of media such as verbal discussion, written handouts, videos, etc.
     (Stewart et al., 2000; So et al., 2003)
REFERENCES


Borgognoni, L. Biological effects of silicone gel sheeting. *Wound Repair and Regeneration, 10*, 118-121.


Harness & Strapping Systems
By Ingrid Parry, M S PT
Face Mask Harnessing

Presented by: Ingrid S. Parry, MS, PT
Contributions by: Mary Jo Baryza, PT, MS, PCS; Mary E. Dougherty, PT; Rey Eugenio, Orthotics technician; Beth J. Franzen, OTR/L; Lisa Forbes-Duchart, MSc, OTReg (MB); Peggy Paradise, Garment Technician

The procedure for fabricating a transparent face mask has been described in detail. 1,2 However very little has been published on harnessing or anchoring face masks. Most of the literature simply states that the forces of the strapping material used to secure a transparent face mask should be distributed over the whole crown of the head. 3 Only a few studies describe the design of the strapping system. 4,5 Included here, are six different methods of harnessing that are used throughout various burn centers. Materials needed, methods for fabrication, and photos of each harness system are included when possible. Additionally, the apparatus used to anchor the straps to the mask are described.

Harnessing systems described:

I. Five or Three Point Neoprene Harness with Velcro Anchors
II. Five Point Elastic Loop with Buckle Anchors
III. Beanie Cap with Snap Anchors
IV. Velfoam Headpiece with Snap Anchors
V. Double ‘Y’ Straps with Rivet Anchor
VI. Six Point Velfoam Pad with Cut-out Anchors

I. FIVE (OR THREE) POINT NEOPRENE HARNESS WITH VELCRO ANCHORS

Materials:
Elastic, neoprene, or betapile
Loop Velcro® (non-sticky back)
Heavy duty sticky back hook Velcro®
Scissors
Tape Measure
Needle and thread/ sewing machine

Measurement:
Five Point – Five areas of attachment include the center of the forehead, bilateral temporal area, and the bases of the bilateral jaw. To assemble this system, three measurements should be taken:
   A. Posterior distance between right and left temporal area
   B. Posterior distance between the base of the right and left jaw
   C. Midline of the head from the center of the forehead to the bottom strap; mark where the middle strap will intersect

   OR

Three Point – Three areas of attachment include the center of the forehead, and the bases of the jaw bilaterally. To assemble this system, two measurements should be taken:
   A. Posterior distance between right and left base of jaw
   B. Midline of the head from the center of the forehead to the bottom strap

Procedure for Fabrication:
1. Subtract 1 inch from the above measurements to allow elastic to stretch
2. Cut chosen strapping material to the above lengths
3. Cut five (or three) pieces of loop Velcro® to approximately 1.5 to 2 inches long
4. Sew strapping material in a modified “H” (five point) or “T” (three point) pattern
5. Sew loop Velcro® to the five (or three) ends to prevent the neoprene from separating over time.
6. Adjust as necessary

Anchors: Secure heavy duty sticky-back hook Velcro pieces onto mask in the desired locations (3 or 5) on mask.

Photo:
II. FIVE POINT ELASTIC LOOP WITH BUCKLE ANCHOR

Materials (straps):
Leo G Stein & Co. 1 inch wide black elastic loop
Leo G Stein & Co. 1 inch wide black hook Velcro® (‘‘fastening tape’’)
Scissors
Tape Measure
Needle and thread/ sewing machine

Materials (anchors):
5 Rectangular buckles (1/2 inch)
10 inch strip of Vivak® PETG (cut slightly small than ½ inch wide to fit through buckle)
5 nickel plated Speedy rivets
Drill and bit (1/8 inch)

Measurement:
When mask is ready, measurements for straps are taken. The bottom strap is measured from below the patient’s ear, near the tempromandibular joint on one side of the face, around the back of the head, to below the other ear. The middle strap is measured from the temple on one side of the forehead to the temple on the other side, just above the ears. The top strap is measured from the center of the forehead, at the outer edge of the mask, over the top of the head ending where the bottom strap horizontally crosses the base of the skull.

Form used for measurement: Figure A

Procedure for Fabrication of Straps:
1) Use one inch wide stiff elastic that is “fuzzy” on one side for hook Velcro® to stick to it: cut in half lengthwise and serge the cut edges with a two-thread flat-lock serger, so that it will fit through the small buckles on the mask. It is cut to the appropriate lengths based on the measurements (Figure A) with additional length added per Figure B.
2) One inch hook Velcro® is cut to the width of the strap, about 3 ½ inches long. It secures the middle strap to the top strap at the center back. It can be sewn down if fit is certain or left as is, for adjustability.
3) One inch hook Velcro® is cut to the width of the strap for five 2” pieces. These pieces are then sewn onto ‘fuzzy’ side of elastic loop at the ends of each strap. The strap then slides through the buckle, doubles back on itself and is secured by the Velcro® on the elastic strap.
II. FIVE POINT ELASTIC LOOP WITH BUCKLE ANCHOR (CONT.)

Adjustments made to measurements for fabrication: *Figure B*

![Diagram of Uvex Mask Straps](image)

**Procedure for Fabrication of Anchors:**

1) Cut a 2-3 inch long strip of Vivak® PETG narrow enough to fit through a ½ inch rectangular buckle. Slip buckle over the Vivak® strip. Holding Vivak® with needle nose pliers, heat until soft. Fold Vivak® onto itself and press ends together securing the buckle in place.

2) Grind end of Vivak® and smooth corners.

3) Drill small hole in Vivak® strip (1/8 inch drill bit), place aside.

4) Heat tip of nail and gently press into the five designated marks on the mask for strap alignment. This prevents cracking when drilling a hole.

5) Drill a small hole at each of these anchor points using a 1/8 inch drill bit. Use a reamer to remove residue and smooth out hole edges.

6) Place Vivak® strip with anchor on mask lining up the hole in the mask with the hole in the strip.

7) Place the male part of a Speedy rivet into the holes from the inside of the mask. Place the female (flat top) part of the rivet on top of the male part from the outside of the mask.

8) Tap lightly with hammer to close and secure rivet in place.

**Photos:**

![Image ofanchoring process](image)
II. FIVE POINT ELASTIC LOOP WITH BUCKLE ANCHOR (CONT.)

Modifications:
If skin is sensitive or supplies are unavailable, straps can be made out of velfoam and secured with hook Velcro.
III. BEANIE CAP WITH SNAP ANCHORS

Materials:
Breathable Mesh fabric (cotton/ polyester blend)
Twill tape
1” hook Velcro®
1” loop Velcro®
3/4 “ width elastic
4 part snap
Snap setter
Needle and thread/ sewing machine

Measurement: Use pattern to approximate size. Enlarge pattern as necessary.

Procedure for Fabrication of Beanie:
1. Cut the oblong pattern (Figure C) from a mesh fabric. Only one oblong piece is needed. This will be the top of the beanie.
2. Cut the dome-shaped patterns (Figure D) from a woven fabric. Two dome-shaped pieces are needed. These will be the sides of the beanie.
3. Using a 3/8” seam, sew the edge of the oblong piece (side A) to the rounded edge of one of the dome-shaped pieces. Repeat this step by sewing the other edge of the oblong piece (side B) to the rounded edge of the second dome-shaped piece. Sew a top stitch through the mesh making the seam flat toward the center of the beanie (this helps to shape the beanie).
4. Placing twill tape halfway onto the beanie, sew the left edge of the twill tape. To help the twill tape lay flat, gather the edge of the twill tape by pulling a thread from the end of the tape. Fold the material toward the inside of the beanie and sew in order to have the entire twill tape on the inside of the beanie.
5. On the outside bottom edge of the beanie, sew 1” hook Velcro® (the length of this is the circumference of the bottom edge of the beanie). Sew the bottom edge of the Velcro® first. Before sewing the top edge of the Velcro®, snip ~3/4 of the way through the Velcro® at every 1 ½ “ along the strip. Sew the top edge of the Velcro®, allowing it to overlap to fit the angle of the beanie.
6. To make the strap which will help adjust the size of the beanie, sew a 6” piece of hook Velcro® (facing away from the beanie) at an ~20 degree angle (angled toward the beanie). On the other side of this hook Velcro® strap, sew loop Velcro® facing toward the beanie. This strap can be shortened, if desired.

Procedure for Fabrication of Straps and Anchors:
1. Cut ½” wide strips of Velcro® slightly longer than the estimated length from anchor points to beanie.
2. Sew 1” piece of elastic on to one end of the loop Velcro®. Serge the end of the elastic.
3. Using a snap setter, the female end of the snap is set toward the end of the elastic piece with the head of the snap on the non-loop side of the Velcro®.
4. The male part of the snap is set on the mask. On the mask, two snaps are placed at approximately the level of the temple (left and right). Two are placed at the jaw line (left and right) with care taken to avoid the strap line over the ears. One snap is placed in the center of the forehead.
5. Secure snaps and attach loop Velcro to Beanie anchoring mask to desired pressure. Cut extra strap length.
III. BEANIE CAP WITH SNAP ANCHORS (CONT.)

Photos:

Modifications: Use neoprene for bottom strap if bothering ears or causing rubbing. Notch neoprene to shape around bottom of ear.
III. BEANIE CAP WITH SNAP ANCHORS (CONT.)

*Figure C: Beanie (oblong piece)*
III. BEANIE CAP WITH SNAP ANCHORS (CONT.)

*Figure D: Beanie (dome piece)*
Materials:
- Velfoam® Pad (8x6 inches)
- Hook Velcro®
- Needle and thread/ sewing machine
- 1” loop Velcro®
- 3/4 “ width elastic
- 4 part snap
- Snap setter

Measurement: Use pattern to approximate size. Enlarge as necessary. The pattern as shown would be appropriate for a patient ~8 years old and older. For younger patients, the pattern can be adjusted by bringing the horizontal portions closer together and shortening the vertical portion.

Procedure for Fabrication of Velfoam® Headpiece:

1. Using pattern, cut Velfoam® piece to shape. (Figure E) For a cleaner appearance, the edges of the Velfoam® can be serged.
2. Sew 1” hook Velcro® to one side of the velfoam piece, as shown on the pattern.
3. Position on the patient’s head with the Velcro® facing away from the patient’s scalp. The longer vertical portion of the velfoam is positioned on the top of the head. The horizontal portions should be positioned in such a manner as to allow the temple straps and mandibular straps of the mask to come straight back above and below the ear, respectively.

Procedure for Fabrication of Straps and Anchors:

6. Cut ½” wide strips of Velcro® slightly longer than the estimated length from anchor points to headpiece.
7. Sew 1” piece of elastic on to one end of the loop Velcro®. Serge the end of the elastic.
8. Using a snap setter, the female end of the snap is set toward the end of the elastic piece with the head of the snap on the non-loop side of the Velcro®.
9. The male part of the snap is set on the mask. On the mask, two snaps are placed at approximately the level of the temple (left and right). Two are placed at the jaw line (left and right) with care taken to avoid the strap line over the ears. One snap is placed in the center of the forehead.
10. Secure snaps and attach loop Velcro® to each arm of the headpiece, anchoring mask with desired pressure. Cut extra strap length.
IV. VELFOAM® HEADPIECE WITH SNAP ANCHORS (CONT.)

Figure E: Velfoam Headpiece
V. DOUBLE ‘Y’ STRAPS WITH RIVET ANCHOR

Materials:
Four Cervical traction bands (Orthoband Company at www.orthoband.com); style #9A (1-stripe called medium hard) and #9D (2-stripe called hard). They come in packages of 10.
Rivets
Needle and thread/ sewing machine
Headband (optional)

Measurements:
Estimate or measure length needed by following projected line of Double Y strap: from rivet at the temple of the mask, to the back of the head, down the center of the back of the head, and then back out to the mastoid on the mask.

Procedure for Fabrication:
1. Sew the ends of 2 straps together to form one long strap for each side of the strap.
2. Place metal adjuster is close to the end so you have room to shorten straps as they loosen over time. Make sure both ends have an adjuster.
3. Have patient try on the mask and pin straps together at crown of head and at occiput.
4. Sew straps together side by side from where one pin connects straps to the other pin. Adjust straps as necessary.
V. DOUBLE ‘Y’ STRAPS WITH RIVET ANCHOR (CONT.)

Procedure for Anchors:
1. Secure rivets on mask
2. Top two rivets are placed at the level of the temple on either side of the face.
3. Bottom two rivets are below the line of the ear at the base of the jaw.

Photos:

Modifications:
1. Pre fabricated Double Y straps can be made and modified as necessary by adding/ removing stitches.
2. A pad overlying the scalp increases comfort.
3. A headband can be secured to forehead using sticky back hook Velcro® to anchor the mask in place.
VI. SIX POINT VELFOAM® PAD WITH CUTOUT ANCHORS

Materials:
Wide Velfoam®
Leo G Stein & Co. 1 inch wide black elastic loop
Leo G Stein & Co. 1 inch wide black hook Velcro®
Scissors
Tape Measure
Needle and thread/ sewing machine

Measurement:
When mask is ready, measurements for straps are taken. The bottom strap is measured from below the patient’s ear, near the temporo-mandibular joint, around to the base of the Velfoam® pad. The middle strap is measured from the temple of the forehead to the sides of the Velfoam® pad. The top straps are measured from 1-2 inches from the center of the forehead to the top of the Velfoam® pad. Length is added per Figure F.

Procedures for Fabrication Pad:
1) Cut 3x6 inch rectangular piece of Velfoam®.
2) Round off corners. Serge edge.

Procedure for Fabrication of Straps:
1) One inch wide stiff elastic that is “fuzzy” on one side for hook Velcro® to stick to it: cut in half lengthwise and serge the cut edges with a two-thread flat-lock serger. Straps are cut to the appropriate lengths based on the measurements (Figure F).
2) Straps are attached to the Velfoam® pad at points indicated on Figure G with the zigzag stitch.
3) One inch hook Velcro® is cut to the width of the strap for five 2” pieces. These pieces are then sewn onto the ‘fuzzy’ side of elastic loop at the ends of each strap. The straps slide through the holes cut in the mask of the same width. Straps double back on themselves to secure.

Figure F:

Figure G:
VI. SIX POINT VELFOAM® PAD WITH CUTOUT ANCHORS (CONT.)

Anchors:
1. Cut six small rectangular holes in the mask: two equal distance from the center of the forehead, two at the level of the temples, and two below the line of the ears over the TMJ joint.
2. Use drill to begin hole and router to shape and enlarge hole to desired size (straps must fit through).

Photos:

Modifications:
Pad can be made out of wide elastic material for more elasticity.
Facial Scanning Technology
By Beth Costa OTR
The Future of Facial Scanning

Beth Costa, OT
Harborview Medical Center
Seattle, WA

Find a company

• CIMMED - Algona, WA
  – www.Cimmed.com
• Total Contact - Germantown, OH
  – www.Totalcontact.com
• Hanger – national locations
  – www.Hanger.com

System overview with company

• Rent vs. Purchase options
  – Company will instruct on use of scanner and computer programs
• Vendors may be able to do on-site scans
The Process

• Therapist or company “scans” the patient

The Process

• Email scan to company (if therapist scanned)
• Coordinate scan changes and required dimensions with company

The Process

• Company will fabricate positive mold
The Process

• Company will pull Silon or Uvex face mask

The Process

• Company will send positive mold and mask to therapist to manually modify and fit to patient

• Therapist can also use positive mold to pour silicone elastomer mask (for use under a fabric face mask)

Pros and cons

• Pros
  – Time for fabrication significantly decreased vs. manual method
  – Positive mold is uniform material
    • no hard vs. soft spots as with plaster positive mold
  – Some models can be used in any location
    • OR, patient’s room, ICU, outpatient clinic

• Cons
  – Need Dremel rotary tool if manually modifying
  – Learning curve with computer program to modify scan
  – Expensive to purchase
  – Not all companies will rent or do on-site scans
References

- Moffit N. Scan it, build it. *Quality Digest.* 2008;28
Image Enhancement & Color Techniques
By Lisa Forbes Duchart, MSc OT Reg
Linda Bailes OT Reg
OBJECTIVES

At the conclusion of this presentation, participants will be able to:

1. Describe the benefits of an Image Enhancement Program to improve self image and social reintegration
2. Implement practical behavioral strategies for assisting burn survivors to handle social challenges
3. Access resources on how to develop a Behavioural and Enhancement Skills Training Program

INTRODUCTION

- Goal of an Image Enhancement (I.E.) Program:
  - Teaching burn survivors to look and feel their best

- Consists of:
  - Colour analysis
  - Creative cosmetics
  - Behavioural skills training

WHY IS AN IMAGE ENHANCEMENT PROGRAM IMPORTANT?

The Psychology of Appearance

- The face is important for overall body image
  - It is a representation of the individual
  - It provides a means for communication
    (Cole, 1998; Cunningham et al, 2002)

- There is great value placed on physical appearance. We are a society of first impressions. A stereotype exists: a desirable face shape translates to positive personality traits and high intelligence (Kammerer-Quayle, 2006).

- Sociological and historical influences have contributed to this stereotype: children’s movies, books and adult popular culture are filled with examples of evil characters being scarred or disfigured. Freddy Kreuger from Nightmare on Elm Street, Phantom of the Opera, Darth Vader and Scar from the Lion King are examples. (Figure 1)

Figure 1: (l to r) Freddy Kreuger; Scar; Darth Vader; Phantom of the Opera
People are influenced by appearance:
- Job recruiters have a negative perception of disfigured applicants (Stevenage & McKay, 1999)
- People stand/sit farther away from disfigured individuals (Houston & Bull, 1994; Rumsey et al., 1982)
- Teachers expectations are lower for disfigured children (Walters, 1997)

Common reactions to disfigurement are rejection, over-hearty acceptance or plain embarrassment (Goffman, 1970). This has devastating consequences for the disfigured individual (Kammerer-Quayle, 1993, 2006; Lansdown et al., 1997; MacGregor, 1990):
- Focus of negative judgment and prejudice
- Dealing with stares, hurtful comments, intrusive questions
- Decreased body image and self-esteem
- Depression
- Difficulty making friends, marrying, obtaining a suitable job

How Image Enhancement Can Improve Self-Image and Ease Social Reintegration

- Facial and body differences receive less significance and importance during rehabilitation because it is regarded as cosmetic and not a functional impairment. Disfigurement, however, causes as much impairment in one’s life as does a functional impairment (Dion et al., 1972; Elks, 1990).
- Plastic and reconstructive surgeries do a great deal to help the facially disfigured, but have limitations (Kammerer-Quayle, 1993, 2006):
  - Discolouration, scarring and asymmetries in facial features is inevitable
  - Many burn survivors are left with a feeling of hopelessness
- The use of cosmetics provides a beneficial effect on how others perceive a person, on self-perception and on quality of life (Aydogdu et al., 2005; Graham & Jouhar, 1980; Holme et al., 2002; Kanzaki et al., 1998; Kent, 2002). Creative cosmetics can be described as a form of “fluid prosthesis” (Roberts, 1986).
- Make-up is an essential component of facial restoration (Rose, 1995) BUT cosmeticians may not be trained to appropriately deal with scarring, body image and self-esteem. Using cosmetics to disguise disfigurement may provide more problems than it solves without the appropriate programs of adaptive skills. Even if scars are covered, the disfigurement is still there (Roberts, 1986).
- An I.E. program includes correct application of products, medical etiquette, terminology, communication skills and confidentiality. The patient must be treated as a whole person, and not just for the disfigurement. Caring touch and a sensitive patient approach must be used (Roberts, 1986).
- Members of the burn team are in a unique position to provide an I.E. program. Complete healing from a trauma involves more than just healing an open wound, improving ROM or “fixing” the face. We must help burn survivors to accept their disfigurement and feel comfortable functioning within their environment.
- Looking their best can ease community re-entry for burn survivors. Introduced early, an I.E. program may offer hope to survivors, help develop new images of themselves and resolve the loss of former image (Kammerer-Quayle, 1992 & 1993).
- Often it is just self-confidence that patients need, and not a cover cream, to help them fully participate in their lives again (Roberts, 1986).
OVERVIEW OF OUR IMAGE ENHANCEMENT PROGRAM

- Offered to men, women and children
- First session usually approximately 2 hours
- 2 occupational therapists/session
- Structure of session:
  - Basic interview (if new client)
  - Pre-questionnaire
  - Explanation of session: make sure expectations are realistic!

Figure 2: Image Enhancement Program at Winnipeg Health Sciences Centre

Components:

1. Colour Analysis (Figures 3&4)

- Certain colours look better if they are in harmony with hair, skin, and eye colour
- Colours not in harmony can magnify scars or discolouration
- Goal: create a wholeness to one’s image
  - Adds clarity to the skin
  - Results in a more energetic and vibrant look
  - Instills confidence

Figure 3: Colour drapes

Figure 4: Colour analysis process
2. Creative Cosmetics (Figures 5 – 11)
- Specialized products applied
- Goals:
  - Reduce redness/discolouration, therefore creating a consistent skin tone
  - Restore missing or asymmetrical features: eyebrows, lip line
  - Enhance attractive features, such as the eyes, thereby reducing focus on scarred areas
  - Introduce as early as 5 days post-op

Figure 5: Creative cosmetics

Figure 6: Creative cosmetics used at POD#5 – drastically decreases patient’s redness. Allowed her to feel more self-confident leaving the hospital. *Note: product not used over open areas.*
Figure 7: Creative cosmetics even out skin colour and draw attention to the lips and eyes. Complimentary clothing colours add a vibrant, healthy look to the skin.

Figure 8: Creative cosmetics even out skin colour and complimentary clothing colour add a vibrant, healthy look to the skin.
Figure 9: Creative cosmetics even out skin colour, create a symmetrical lip line, create eyebrows, and draw attention to the eyes.

Figure 10: Creative cosmetics create eyebrows and a symmetrical lip line. Facial harmony and balance is restored.
Figure 11: Creative cosmetics even out skin colour and create eyebrows. This man was a salesman and was told he couldn't do his job because of his facial appearance. After his session, he said, "This is the first time I’ve seen my face all one colour for so long. I didn’t know this was possible."

3. Positive Communication Skills

- STEPS to Social Comfort & Confidence (see Figure 12)
- Rehearse Your Responses

(See Handouts by Barbara Kammerer Quayle)

Figure 12: left – Model NOT demonstrating STEPS to Social Comfort and Confidence

right – Model demonstrating STEPS to Social Comfort and Confidence.
STEPS is a simple and effective “tool” for anyone affected by a burn injury. When meeting strangers, entering new social, work or school situations or going into public places, we can influence how people respond to us. By using STEPS every day, we project confidence and send the message to others that we are self-assured. It takes practice until it becomes authentic, natural, and part of your daily life. Try practicing in front of a mirror.

1. **Self-Talk** — what we say to ourselves and believe
   - I love and accept myself the way I am and the way I am not.
   - I meet people easily and feel comfortable with them.
   - I Can Do It!

2. **Tone of Voice**
   - Friendly
   - Warm
   - Enthusiastic

3. **Eye Contact**
   - LOOK people in the eye—even if only for 3-4 seconds.

4. **Posture**
   - Head raised
   - Rib cage lifted
   - Shoulders back

5. **Smile**
   - Confident
   - Approachable

Imagine you are producing a TV commercial of yourself...use STEPS to produce the confident and comfortable image you want to project to your audience. YOU have total control over the image you choose for your audience to view.

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The “Tool” for Answering Questions

Rehearse Your Responses is a helpful “TOOL” to use when people ask questions about you or your loved one. People with burns and their family members often report feeling awkward, angry, or embarrassed when strangers ask questions about their burns and injury. RYR is the “TOOL” to use.

Writing and memorizing a 3-sentence response to unexpected questions is a “TOOL” that increases your social comfort and confidence. By using RYR you can gain control of social situations and respond calmly to questions with courtesy, kindness, and warmth. Practicing the RYR “TOOL” in front of a mirror also helps you increase poise and confidence.

Example:
“I was burned in an auto crash. I’m doing a lot better now. Thanks for asking.” or “Thanks for your concern.”

The response of “Thanks for asking.” or “Thanks for your concern” closes the conversation.

If the person requests more information and you choose not to continue talking or don’t want to provide details, politely respond with, “That’s all I care to discuss today; I’m sure you understand.” Smile warmly at the person and walk away.

Practice your RYR in front of mirror.

Be sure to use your STEPS...

Self-Talk—“I can handle this easily and confidently,”
Speak in a friendly Tone of voice
Look ‘em in the Eye
Posture—Stand up straight
Give people a warm, confident Smile.

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Write Your Own 3-Sentence “TOOL”

1. **First sentence states:** How you were burned or when you were burned.
   **Example:** “I was burned in a house fire.” OR “I was burned a few months ago.”

2. **Second sentence states:** How you are doing now.
   **Example:** “I’m getting better all the time and still having surgeries.” OR “I’m doing better now.”

3. **Third sentence states:** Ending the conversation.
   **Example:** “Thanks for your concern.” OR “Thanks for asking.”

On a day you have low energy or just don’t feel up to questions:
**Example:** “I had a burn injury. I don’t care to discuss it.” Smile and walk on.

**Remember:** If a person requests more information and you choose not to talk more; politely respond with, “That’s all I care to discuss today; I’m sure you understand.” Smile warmly and walk away.

**Practice your RYR in front of mirror.**

Be sure to use your **STEPS**

- **Self-Talk**—“I can handle this easily and confidently,”
- **Speak in a friendly Tone of voice**
- Look ‘em in the **Eye**
- **Posture**—Stand up straight
- Give people a warm, confident **Smile**.

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Staring Is a Fact of Life

Before a burn injury, we shopped, attended movies, and walked through malls rather anonymously. Life changes abruptly when we suffer a burn injury. After discharge, there is suddenly a great deal of unwanted attention everywhere we go. It can be overwhelming for us and for our family.

Before and after discharge, patients and families need a “coach” who openly discusses the fact that people may stare. Our thoughts and self-talk can create all kinds of rationale about why people stare. It is a reality of life that looking different draws attention. Patients and families can be reminded that it seems to be part of human nature to look at people with some type of difference. We look at people who are deaf and use sign language, people in wheelchairs, people wearing native costumes from another country, and people whose gait is uneven because of a disability. People often stare out of curiosity or concern, and very few stare to be rude.

It is difficult to change the public and their reactions to a burn injury, but we can take responsibility for our reactions to staring. Do not give power over your life to people you do not know and may never see again. This makes strangers more important than you are. Continuing to focus on whether people are staring at us prevents us from living in the present. Being fully involved in life without concerns about what others think or do increases the joy of life’s journey. By using the BEST “Tools,” you will increase your social comfort and confidence when someone stares.

Staring usually occurs while standing in lines, sitting in restaurants, shopping, and walking among large crowds. These activities may seem awkward and scary at first. Until one is more comfortable and confident, taking a family member or friend along may ease anxiety.

Staring “Tool”

When someone stares, the easiest and fastest way to stop the uncomfortable moment is to use the following STEPS “Tools”:

• Stand up straight, look the person in the eye, smile, and confidently say, “Hi, how are you doing?” or “Hi, nice day, isn’t it?” or any friendly “small talk.”

The person staring usually responds in an equally friendly way, speaks to you, and the staring ends. By smiling and speaking to someone who is staring, you change the “energy” of the interaction and the person sees you as a person and rather than focusing on your burn injury.

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Teasing “Tools”

The Power “I”… “I want you to stop doing that.”
“I don’t answer questions like that.”

The SHRUG… “so what”; “I don’t care”; “whatever”
…smile, act bored, and walk away

The MIGHTY MIGHT… “You might be right.”

Humor & Exaggeration…
“Why thank you for being so kind”;

Oh, you’ve noticed I have a facial difference;
aren’t you a genius?”

“Didn’t your parents teach you it’s rude to make fun
of people? Well, they should have.”

“Oh, you’re right. I wish I were just like you.”

Silencing the Teaser
“I’m wondering what would make you say something like that?”

“Oh, you’re so funny. For a second I thought you were serious.”
“If you were serious, I guess you’re not funny, just rude.”

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Prepare and Practice...

*these life situations or use one that has happened to you.*

A lady at the grocery store sees you, walks over to you and kindly asks, “Oh, I bet you were in a bad accident.” How do you respond?

Walking to school, a child says, “You really look bad!” What “tools” will you use?

In the check out line at a department store, a girl and her mom keep staring at you. What is your response?

A student across from you in class asks, “What did you do to yourself?” What “tools” do you use?

In a restaurant dining with your family, someone yells, “Halloween is over. Take off your mask.” What is your response?

As you walk down the aisle while boarding a bus, train, or plane, several people take a long look at you. How do you respond?

At a mall someone walks up and suddenly asks, “Hey, what happened to you?” What “tools” do you use?

While waiting in a medical office, you notice several people staring at you. How do you react?

Choose your own…

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It Starts With YOU!

Introducing Behavioral “TOOLS” to Patients and Families

An important aspect of patient care is introducing the topic of community reentry and the potential challenges for the patient and family. Some “teachable moments” appear daily when giving medication, offering a snack, a trip off the unit to x-ray or later in the evening when the unit may be quieter. Below are some examples to assist you to develop your own personal delivery style.

INTRODUCING THE INITIAL “YOU’LL BE GOING HOME SOON” CONVERSATION

Example:
“Mr. Brown, you know in a few days you’ll be discharged. I was wondering how are you feeling about going home? (wait for the answer) Some people have found that leaving the burn center is a little scary. For one thing, you will have to adjust to doing more for yourself. The other adjustment is that you’ll be noticed a lot more than before because of your burns (the bandages, pressure garments.) Some people may ask what happened and others will look at you or even stare…because most people just haven’t known someone with a burn so they are a little curious and compassionate. We do have some “TOOLS” to help you so it isn’t such a challenge. Would it be OK if we discussed them now?”

HOW TO INTRODUCE THE STARING “TOOL” TO PATIENTS AND FAMILIES

Example:
“Mrs. Jones, when you go home, it’s important for you to start going out to do your usual activities. This is important for your total recovery. Some people in the community have not seen someone with a burn injury before. They may be so curious about your injury that they may stare at you. People don’t mean to be rude. We want you to be prepared and have a “TOOL” to help you to manage any staring that may occur. It will help you feel in control of each social situation, feel more at ease wherever you go and not be surprised. Would you like me to show the “TOOL” to you now?”

HOW TO INTRODUCE THE RYR “TOOL” TO PATIENTS AND FAMILIES

Example:
“Mr. Gomez, soon you’ll be going home, and I wanted you to be prepared to go out in public again. Because many people don’t know anything about burns, they may come up and ask about your injury. People don’t mean to be rude; they’re usually just curious and compassionate. Sometimes people may approach you in the grocery store, walking through a mall, or even at a restaurant. I want to give you a
“TOOL” to help you with questions called Rehearse Your Responses or RYR. We find if patients are prepared in advance with just 3 simple sentences, you’ll feel more at ease and not be taken off guard. Would you like me to go over it with you now?”

HOW TO INTRODUCE THE STEPS “TOOL” TO PATIENTS AND FAMILIES

Example:
“Bob, when people leave the burn center and begin going out in the community, sometimes they feel a little uncomfortable at first because all of the attention from people. How you present yourself will affect how people respond to you. For example, if I came in today with my shoulders slumped, had no eye contact with you, and didn’t smile, you and I would have a hard time communicating because you would feel uncomfortable with my behavior. So, we have a “TOOL” called STEPS that are behavioral skills that can really help you project confidence in yourself. I’d like to go over the STEPS “TOOL” now if that’s ok?”

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RESOURCES

1. Products

Cinema Secrets: www.cinemasecrets.com
Maurice Stein: maurice@cinemasecrets.com

Dermablend: www.dermstore.ca

2. To develop an Image Enhancement Program

See information on next page for Behavioural & Enhancement Skills Training

*Creative cosmetics training is extra, ask about fees and availability

3. Support for Burn Survivors

The Phoenix Society for Burn Survivors: www.phoenix-society.org

AboutFace International: www.aboutfaceinternational.org
The Phoenix Society for Burn Survivors
presents
Behavioral & Enhancement Skills Training
empowering burn care professionals to deliver community reintegration tools

BEST is an informative workshop for the entire Burn Team that teaches and demonstrates effective and practical behavioral and social skills TOOLS. This interactive and fun workshop provides Burn Team members the “coaching” methods and strategies required to confidently enable survivors and their families to make an optimal transition back to their communities.

BEST supports survivors and their families to successfully address common social concerns and fears. BEST offers Social Control, Competence, Confidence, and Comfort when encountering:

- Social, work, and school reentry challenges
- Social anxiety and avoidance
- Side comments and whispers
- Body image perceptions
- Intrusive questions
- Rude remarks
- Stares
- Rejection
- Teasing

BEST Training Cost - $1000 for each day. Includes: preparation, presentation, materials/handouts, and follow-up

  Additional Costs: Travel Expenses of BEST facilitator.
  Full day is usually 8:30am to 4:30pm. Breaks and lunch arranged by host organization.

The BEST Training is presented by Barbara Kammerer Quayle, MA, a burn survivor experienced in developing community reintegration programs and working with burn care professionals and survivors throughout the country.

Phoenix Society: (800) 888-2876 or (616) 458-2773

ACKNOWLEDGEMENTS

Thank-you to Barbara Kammerer Quayle, our Image Enhancement mentor, for her support and assistance in every stage of this workshop development. Barbara assisted with the information provided in this handout and was instrumental in securing the Books of Image Enhancements and BEST wallet cards.
REFERENCES


APPENDIX
Fabricating Transparent Facial Orthosis
Regions Hospital, The Burn Center
Marianne Bruns, OTR

Game plan prior to draping plastic
Marking moulage-outline areas requiring coverage
Heat toaster oven (204°C/400°F)
Position and secure moulage in vise
Determine size of plastic sheet required (i.e. precut sheets, scoring)
Cutting plastic-utility knife

Heating plastic
Teflon™ lined cookie sheet
Time of heating 1-2 minutes at 204°C/400°F (i.e. Flipping plastic at least 1x)
Problems that may arise
   Overheating/bubbling
   Under heating/non-pliable

Draping plastic over model
Removing plastic from oven
Two person technique
Centering plastic on model
Draping plastic-pulling plastic
Massaging plastic into all contours of mold
Missed areas-early spot heating

Marking Plastic
On model & patient
   Outer edge
   Eye opening
   Mouth opening
   Nasal opening

Cutting plastic
Leaving extra plastic
Scissors (i.e. careful not to scratch of crack plastic)
Dremel™ tool

Finishing Edges of plastic
Sanding with Dremel™ tool
Steel wool

Rivet Location
Temple
Mastoid
Special considerations
   Symmetrical & asymmetrical placement
   Avoiding acute hypertrophic scars if possible
   Distance from edge-at least 1 cm
Hole punching for rivets
Size-should be slightly larger than rivets used (1/16")
Rotary punch
Standard punch
Dremel™ tool

Securing Rivets
Start with base
Attach cap

References

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Material List for Making Transparent Facial Orthosis

1. Plastic
   W- Clear transparent high temp plastic
   1/16" x 18" x 24"=28.95
   Smith & Nephew Rolyan Item #A295-1
   Smith & Rolyan (tele: 800-558-8663)
   One Quality Drive, P.O. Box 1005
   Germantown, WI 53022-8205 U.S.A.

2. Rivets #74 with caps
   1000 per packages
   Feiner Supply
   5089 N.E. 12th Avenue
   Oakland, Florida 33334

3. 3M Steel wool & sanding sheets
   Fabric sheets
   Silicon Carbide type 18, 120 grit
   Part #051144-10458
   $1.85/per sheet, min. 50 sheet per order
   Warren Industrial (tele: 612-378-7300)
   2211 E. Hennepin Ave
   Minneapolis, MN 55413

4. Virgin teflon and pads (for heating plastic in oven)
   3 mil-Teflon
   Standard glass fabric
   36 inch x 36 yd roll
   Laird Plastics (tele: 651-486-0047)
   3711 N. Lexington Ave.
   Shoreview, MN 55126

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Tool List for Making Transparent Facial Orthosis

1. Toaster oven—We use Toastermaster Deluxe System III broiler oven
   Model #7008

2. Heat gun
   Weller heat gun
   Model #6970
   Cooper hand tools
   Weller Products (tele: 919-362-7511)
   Lufkin Road
   Apex, NC 27502

3. Dremel moto-tool- (variable speed)
   Moto tool
   Model 395-type 4
   Dremel (tele: 414-554-1390)
   4915 21st Street
   Racine, WI 53406

4. Samson punch- drill press or drive punch
   NC 12703 Samson punch $63.95
   NC 12703-2, 4 or 6 die set $21.95
   North Coast Medical Inc. (tele: 800-821-9319)
   Morgan Hill, CA USA 9503702845

5. Scissors- SIMS 8" CVD BB
   Bird & Cronin Inc. (tele: 800-328-1095)
   1200 Trapp Road
   Eagan, MN USA 55121

6. Scissors-SNIPS APS deluxe all purpose
   Bird & Cronin Inc. (tele: 800-328-1095)
   1200 Trapp Road
   Eagan, MN USA 55121

7. Misc tools- Utility knife, hammer, vice, anvil, cotton work gloves
   Any hardware store
SILICONE RUBBER FACE PADS

ROLANDO MORALES, SR.
SHRINERS BURNS HOSPITAL
GALVESTON UNIT
DEPARTMENT OF MEDICAL SCULPTURE
815 MARKET STREET
GALVESTON, TEXAS 77550
MARCH 14, 2000
STEPS IN MAKING A
CUSTOM SILICONE FACE PAD

Purpose: To provide a constant equal controlled pressure over the entire face. These pads are easy to clean, give soft, but firm pressure and does not tend to break down skin tissue. Pads last 3-9 months and may be duplicated in two hours. Pads are to be worn under a Jobst Hood at all times for a period of 3-36 months, or for as long as scar tissue remains active. They may be removed for eating, bathing, or changing to a new pad.

Step #1 Make a positive plaster impression of the entire face. This should be up to the hairline and as close to the ears as possible. Cast should be approximately 1/2" thick. Dry the cast.

Step #2 Sand or scrape down scar tissue on the mold to achieve a normal appearance. It may be advisable to do this in "stages" whenever severe scarring is present. This would mean processing a pad, then sanding more of the scar tissue, and processing another pad. Each successive pad will thereby put an increasing amount of pressure where needed until a normal appearance is achieved.

Step #3 Seal the plaster cast with shellac or a similar plaster sealer. With a pencil, draw the outline of the pad.
Step #4 Using plastelene, sculpt over the cast, up to the pencil line. Pad thickness should be around 1/8" overall, with tapered edges as shown in figure 1. The area between the nose and cheek must be sculpted as shown in figure 2. This allows for an equal pressure under the Jobst Hood. Finish the surface of the plastelene pad smooth.

Step #5 Build up any areas of undercuts on the plaster cast to permit separation of the mold. Apply a release agent to all exposed plaster areas. A fairly thick mixture of dental stone works best to build up the outer shell to a thickness of about 1/2". After setting approximately one hour, separate the two halves, remove all traces of plastelene, and sand down any imperfections in the mold.

Step #6 Apply a thin layer of vaseline to both halves of the mold to permit separation of the silicone pad. Mix 150cc's of RTV 6382 and 75cc's of silicone fluid in a large disposable container. Add 40 drops of catalyst to the mixture and spatulate thoroughly. Place mixture in a de-bubbling device for about 3 minutes. Pour and spread a thin layer of rubber over the entire plaster portion. Drape a stockinett material over this rubber layer for added tear strength. Pour the remaining rubber into the stone portion of the mold. Spread to all surfaces of the inner mold. continued
figure 1.
Face pad should be 1/8" tick overall, with tapered edges.

figure 2.
Area between nose and cheeks need filling.
Be careful not to mix in air bubbles. Close both halves together and align properly. The mold may be hand-held, clamped shut, or weighted down until set. Working time is approximately five minutes.

Step #7 After the rubber sets, separate mold and remove the silicone pad. Trim pad with a pair of curved scissors up to the pencil lines. Let the pad air-dry awhile and dust with baby powder. Place completed pad on patients' face and secure with the Jobst Hood.

Notes: Amount of catalyst may be varied to allow more or less working time.

Any bubbles in the finished pad can be filled with catalized rubber or clear tub and tile sealer. Place either in a syringe and squirt into the air bubbles to fill.

Materials and supplies list:

- plaster of paris
- dental stone
- plaster mixing bowls
- spatulas
- plastelene
- modeling tools
- sandpaper
- vaseline
- RTV 6382 Silicone Rubber
- silicone fluid, 200-100cs.
- silicone tub & tile sealer
- stockinette material 4-6"
- tongue depressors
- procedure gloves
- baby powder
- disposable cups, 600cc's

All items above are available at most art, dental, and or hospital suppliers. RTV 6382 Silicone rubber is available from Factor II. Their telephone number is (520) 537-8387 to request a catalog and get current prices.