

Chapter 25:

Burns

Missy Thurlow, MBA, OTR/L, CHT and Patricia Anderson, OTR/L, CHT

I. Introduction

- Hands are the most frequent site of thermal injury¹
- Flame burns are the most frequent cause of burn injury in adults²
- Scald burns are the most frequent cause of burns in children²
- The skin covering the hand is equivalent to 5% of the total body's surface area¹
- A burn of any depth to the hand is classified as a major injury by the American Burn Association¹
- Most common complications after a burn injury to the hand are post burn edema, compartment syndrome, joint deformities, sensory impairment, restricted use of the hand¹
- Burns of the hand and upper extremity can interfere with functional performance in ADL's and work activities²

II. Wound Classification

- Types of Burns
 - Cutaneous²
 - Caused by application of heat, cold or caustic chemicals
 - Depth of burn varies based on length of contact to heat element and temperature
 - Depth of burn determines healing potential and need for surgical intervention
 - Cold (frostbite)³
 - Skin and underlying tissues damaged
 - Blood flow interrupted, hypertonic tissue environment noted
 - Chemical Burns⁴
 - Caustic reactions seen, cellular membranes disrupted
 - Toxic effects on metabolic process
 - Duration of exposure, chemical agent determines severity
 - Systemic absorption of some chemicals can be deadly
 - Electrical Burns⁵
 - Electrical energy is transformed into thermal energy as current passes through tissues
 - Injury to cell membranes disrupts membrane potential and function
 - Severity of injury depends on current pathway, resistance to current and strength and duration of current flow
 - Burn Depth and Classification⁶
 - Significant determinant of mortality
 - Primary determinant of the patient's long-term appearance and functional outcome
 - Epidermal (1st degree)⁶
 - Usually sunburn
 - Only involves the epidermis

Chapter 25: Burns

Missy Thurlow, MBA, OTR/L, CHT and Patricia Anderson, OTR/L, CHT

No blisters, but red and very painful
2-3 days until redness and pain subside.

Partial Thickness Burns (2nd degree)⁶

Does not extend entirely through the dermis

Epithelial-lined appendages - sweat glands, hair follicles and sebaceous glands remain intact

When dead tissue removed, epithelial cells migrate from the surface of each dermal appendage to other epithelial cells from neighboring appendages, forming new, fragile epidermis on top of thin residual dermal bed

Deeper burn takes longer to heal and scarring can be severe

If burns heal spontaneously within 2-3 weeks, no hypertrophic scarring or functional impairment is noted, but pigmentation changes may be apparent

Burns that take longer than 3 weeks to heal may produce hypertrophic scars and functional impairment. A thin, fragile epithelial covering will be present many weeks.

Often accumulate a layer of fibrinous exudate and necrotic debris on surface

Deep partial thickness burns extend into lower layers of dermis.

These heal within 3-9 weeks. Scar formation is common and often is hypertrophic. Joint function may be impaired. Excision and grafting is usually needed.

Full Thickness Burn (3rd degree)⁶

Involves all layers of dermis and underlying subcutaneous adipose tissue

Burn eschar (dead and denatured dermis) is present.

When left in situ, eschar separates from the underlying viable tissue, leaving an unhealed bed of granulation tissue

Deeper structures may be involved such as muscle, tendon, ligament and bone, and might be classified as deep full thickness or 4th degree

Coverage options include skin grafts, biologic dressings and skin substitutes

Amputation or tissue transfers may be required (Fig. 1)

III. Surgical Management/Wound Coverage⁶

Escharotomy

Surgical incision through burn eschar. Usually done within 24 hours of burn injury. When the burn eschar circumferentially surrounds any body structure, the tissues are subject to increasing interstitial pressures which limit venous outflow and decrease arterial inflow. Compartment syndrome may occur which leads to ischemia or necrosis within or distal to that body part within hours. The restricted tissues are released with the incisions usually on the medial and lateral side of the extremity.

Once the patient is stable, the eschar can be removed until a viable underlying tissue level is visible.

Debridement of Burn Wounds⁶

Removal of loose, devitalized, necrotic or contaminated wound tissue using mechanical or sharp technique.

Debridement cleans off the wound surfaces to optimize wound healing. This is usually done on shallow burns that are expected to heal without the need for skin grafting.

Excision of Burn Wounds⁶

Excision is a surgical procedure requiring incision through the deep dermis of open wounds, burn eschar, or burn scars and all necrotic tissue. This may be used in preparation for surgical reconstruction. Options following surgical excision include topical antimicrobials, temporary biologic covers, immediate grafting, flap closure or other reconstructive procedures.

Performed by experienced burn surgeons

Single stage excision and grafting requires donor sites for skin harvest, excision of the burn wound and harvesting the donor skin. Donor skin may be meshed to expand the coverage area and is applied to the wound bed with suture, staples, fibrin glue, synthetic adhesives or tapes. Dressings or orthoses may be used to avoid shearing of the grafts and to maintain proper positioning.

Multiple stage excision and grafting is used when the burn wound is large and more than one operation is needed as with facial wounds or extensive burns. With a facial burn, a temporary covering follows excision. In several days, skin autografts are placed. This slower process allows for inspection for problems and can result in often 100% graft take. In patients that have extensive burns, staged excision and grafting may be advantageous as the donor sites have time to reepithelialize between harvesting sessions.

Temporary wound substitutes may be used when wound is too large to be closed in one procedure or there is not enough donor skin available.

Cadaver Allograft is the gold standard temporary skin substitute. Allografts adhere and induce vascularization on an appropriately prepared wound bed. Pain is reduced; loss of fluids, proteins and electrolytes are reduced. Allografts are obtained from a skin bank and may be fresh, refrigerated tissue or frozen.

Skin Xenografts are obtained from various animals but mostly pigs.

Burn Wound Coverage⁶

Small burn wounds are excised and covered by either a full thickness skin graft or a split thickness skin graft. A full thickness graft will contract less but is harder to heal.

Skin substitutes are defined as a biomaterial, engineered tissue or

Chapter 25: Burns

Missy Thurlow, MBA, OTR/L, CHT and Patricia Anderson, OTR/L, CHT

combination of materials and cells or tissues that can be used for skin autograft or allograft.

Skin replacement: A tissue or graft that permanently replaces lost skin with healthy skin. (Fig. 2)

IV. Scar

Scar development and scar contraction are the most significant impediments in recovery from a burn injury.³

Hypertrophic scar

Characterized by the three “R”s: red, raised, rigid during the initial phase of development⁷

Occurs when excessive collagen forms within the boundary of the burn wound⁸

Results from imbalance between collagen synthesis and collagen lysis⁹

Collagen is formed in whorl-type patterns instead of parallel linear patterns of normal skin⁹

Occurs in burn depth that reaches the reticular layer of the dermis²

Often found in areas of motion/joints as the tension along the length of the scar encourages collagen depositions over collagen lysis⁹

Often occurs when full thickness burn wounds are closed with re-epithelialization, granulation tissue formation, and contraction⁹

Burn wounds that are closed by split thickness skin grafting typically do not form hypertrophic scarring over the graft site, however may develop hypertrophic scarring along the seams of the graft or along the edges of the graft and the non-injured skin⁹

May take up to two years to reach maturation⁹

Keloid Scar

Controversy exists whether there is a difference between keloids and hypertrophic scar⁷

Classic definition of a keloid is a scar that forms excessive collagen that does not conform to the boundaries of the wound⁸

Difficult to distinguish histologic differences between hypertrophic scar and keloids⁸

Collagen synthesis is greater in keloid scars than in hypertrophic scar⁸

Hypertrophic scars may recede over time; however this does not typically occur with keloids⁸

Risk Factors of Hypertrophic Scar Formation

Formation of hypertrophic scar after a burn injury cannot be entirely predicted, however several risk factors exist to help predict whether a burn will develop hypertrophic scar⁷

*Length of time for wound closure*⁸

Most important factor in predicting hypertrophy

Burns requiring longer than three weeks to close are at risk

Race - darker pigmented skin generally are at risk⁸

Age - clinically it has been noted that younger people under the age of 30 form more scar than other age groups⁸

Depth - burns reaching into the reticular dermis scar more than more superficial burns that involve the epidermis or papillary dermis⁸

Scar Contraction/Scar Contracture

Scar contraction is the active process of the shortening of scar tissue²

Scar contraction will continue to occur until it meets an equal opposing force⁸

Scar contracture is the end result of scar contraction in which shortened scar tissue has limited the motion of a joint and will require surgical correction⁸

Full thickness skin grafts will greatly diminish scar contraction⁸

Contraction occurring with split thickness skin grafts is proportional to the thickness of the graft; the thinner the graft, the more contraction occurs⁷ (Fig. 3)

Scar Maturation⁸

Scar development begins with the initiation of wound healing

The first 6 months following injury is the most active building phase of hypertrophic scar development

Following the initial 6 months scar maturation can continue for up to 2 years post injury

Longer maturation time is dependent on wound depth and length of time to wound closure

Scar maturation in children can take 12 to 24 months

Scar maturation in adults can take 6 to 24 months

The three “P”s of scar maturation are pale, planer, and pliable

Scar Complex

Normal skin can stretch up to 60% of its resting length as compared to immature burn scar that can only stretch up to 15% of its length^{9,10}

Burn injuries that encompass more than one joint require composite ROM of all joints in combination to place a full stretch to the total burn scar⁹

Chapter 25: Burns

Missy Thurlow, MBA, OTR/L, CHT and Patricia Anderson, OTR/L, CHT

scar complex is the composite scar of all involved joints combined⁹

V. Burn Evaluation⁸

Referral to OT or PT services should be obtained. If the patient is hospitalized, reviewing the record is necessary for optimal understanding of burn location and depth, inhalation, life threatening burns and/or other medical conditions

At the time of injury, initial evaluation may be limited by patient's clinical status or severity of wounds. As the patient progresses, more thorough evaluation can be performed⁷

Burn Wound

Documentation of the extent of the burns, depth, type, and location should be noted. If possible, wounds assessed without dressings¹⁰

Document the date of injury as well as the date of wound closure.

Length of time to wound closure affects scar formation¹

In the hand, skin is not uniform in thickness; depth of the wound may differ depending on the location of the burn. A

circumferential burn may produce a full thickness wound to the dorsal surface and partial thickness to the palmar surface²

Note how the burn wound was closed: skin grafting, skin substitute, or epithelialization¹

Document any open wounds, their location and how they are being managed.

Edema

Can be severe during the first days following burn injury¹

Edema documented by description or circumferential measurements if wounds closed¹⁰

If joints or hands are involved, orthotics necessary to maintain good functional position. Orthoses require modification as edema decreases.⁸

Pain⁸

Pain medications documented including dosage and frequency

Perceived pain documented on a pain scale

As wounds close, pain typically decreases however itching becomes a common problem and can be more intense than the sensations of pain and is often described as a type of pain. These sensations should be noted as well

Sensibility

Testing of the median, ulnar and radial nerves included if the burn is an electrical injury¹⁰

the burn is severe and/or circumferential at risk for compartment syndrome⁷

Manual Muscle Test⁷

Should be assessed in an electrical injury to rule out damage to deep musculature and nerves¹⁰

Chapter 25 Figures

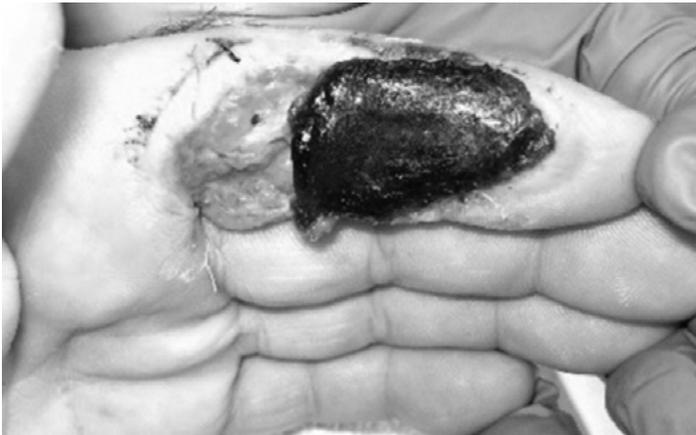


Fig. 1 Full thickness electrical burn with tendon exposure.



Fig. 2 Mixture of wound healing with split thickness skin grafting and granulation tissue.



Fig. 3 Palmar burn scar contraction with scar bands crossing palm and web spaces.



Fig. 4 Full thickness burn with split thickness skin grafting and tendon involvement.

Chapter 25: Burns

Missy Thurlow, MBA, OTR/L, CHT and Patricia Anderson, OTR/L, CHT

Grip and pinch recorded if patient able to perform test and there is no risk of rupture to digital extensors with gripping⁷

Range of Motion: Active and Passive⁷

Should not be aggressive or forceful to avoid tearing of fragile tissues

Note any fractures or exposed tendons that will limit PROM

No ROM or composite digital flexion should be performed on deep burns to the dorsum of the digits until the digital extensor apparatus is determined intact

ROM measured with goniometer if wounds are closed

If wounds are open over a joint, visual estimation or a lateral goniometric measurement are acceptable methods for documentation

Goniometric measurements recorded for each individual joint

Composite digital flexion and extension should be measured in the hand

Limitations of combined motion of all joints involved in the burn should be noted and measured (within the scar complex); most often measured using goniometry, measuring tape, or photography¹

Activities Daily Living

Scar⁷

No universal standard instrument is currently used to evaluate scar

Vancouver Scar Scale is the most widely used assessment

Other methods of documenting scar are standardized photography, written description, and diagrams

Descriptive documentation should include: pliability, vascularity, height, appearance, surface texture, scar pain, severity of itching, and location of scar bands

VI. Treatment of the Burned Hand

Acute phase¹

Edema formation in burned hands hinders motion and may be a factor in later contracture formation. Hands must be elevated above heart level to prevent edema.

Probably most important initial step in hand burn management without hindering resuscitation, pulmonary, or other critical care management in any size burn

Tendon Exposure⁷

Most common location for tendon exposure is dorsum of digits at PIP joint. Often results in loss of central slip, which causes volar pull on lateral bands by the lumbricals which positions the digit in PIP flexion and DIP hyperextension, resulting in a boutonniere deformity

Important to keep moist dressings over any exposed tendons at all times. Xeroform may be used or any hydrophobic dressing may be adequate. If the tendon becomes dry and brittle, it will rupture with resultant deformity.

Overstretching tendon should be avoided during time of exposure.

(Fig. 4)

Range of motion⁷

Without exposed tendon, passive movement can be initiated immediately post injury. Exercise goals include: elongation of the healed skin and scar tissue, maintaining or increasing range of motion of the burned extremity, promoting function in activities of daily living, restoring dexterity and coordination and resuming endurance and strength for return to preinjury activities. Active range of motion should be encouraged throughout the acute stage when patient is able to participate.

Orthoses^{7,8}

Begins early during the acute stage and continues throughout the rehabilitation process. It is important orthoses do not impinge vascular flow.

Therapist begins orthotic fabrication in the acutely burned patient immediately. Orthotics place the patient in a position that will reduce the chance of contracture. Orthoses also used to protect skin grafts and to decrease movement following surgery.

Orthotics initially position the hand to minimize contracture development secondary to edema and wound healing. They may be altered or modified to provide elongation of scar tissue and muscle tendon units.

In the early acute stage, orthotics are held in place with the use of Kling, gauze or ace wraps; later, with velcro. Close monitoring of the orthotic fit is important because of edema changes and tissue tightness

Outpatient Therapy (Post Acute)

Modalities¹²

Modalities including fluidotherapy, moist heat, paraffin baths, or ultrasound with combined stretching to increase tissue elongation can be used on an extremity with no open wounds. If open wounds are present, it is important to protect the areas from modalities.

Range of Motion to the Upper Extremity⁸

Both active, active assistive and passive range of motion is effective during the outpatient stage. Self ROM is encouraged in the outpatient clinic and at home. Entire upper extremity motion is necessary to prevent shoulder and elbow tightness.

Strength and coordination^{8,11}

Strength and coordination tasks are important as well as activities of daily living for independent self care. Fine and gross motor task performance is necessary for independent use of the burned extremity and for return to work/home activities.

Chapter 25: Burns

Missy Thurlow, MBA, OTR/L, CHT and Patricia Anderson, OTR/L, CHT

Edema⁸

Edema may be managed through light pressure garments, such as Tubigrip or Isotoner gloves, and active range of motion exercises to help “milk” edema from the burned hand.

Scar Management⁸

Pressure therapy applied to burn wounds when no or small open areas remain. Tubigrip or custom compression garments needed to manage scar development in deep 2nd or 3rd degree burns.

Orthotics designed to decrease deformities, stretch tightened skin or assist with gaining range of motion are continued from the acute stage. Static progressive or dynamic orthoses may be used to increase ROM in the hand.

VII. Hand Burn Orthoses^{7,8}

Types of Orthoses

Static Orthoses - maintain fixed position, indicated for skin graft protection after surgery or anti-contracture positioning if adequate ROM is not gained by exercise alone. The splints can be modified to account for increased tissue length after exercise or positioning.

Static Progressive Orthoses - usually used if sufficient ROM not obtained with static positioning and exercise. Used for correction of contractures and provide inelastic stress to tissues at end range. Allow adjustment to stress as tissue lengthens via stress relaxation.

Dynamic Orthoses - provide a continual stress to tissue over time. Usually used after the acute burn stage to manage joint contractures.

Orthosis Application⁷

Splints are initially applied within 24 hours to position the hand. Design may be altered or changed to elongate the muscle tendon unit and scar tissue.

Orthotics should be worn at all times except therapist assisted ROM initially, and then weaned to night and between exercise. Designed to minimize the common hand deformities associated with severe hand burns.

VIII. Common Hand Burn Deformities¹

Most frequent burn deformities:

Thumb web space contracture
PIP joint flexion contracture
5th digit boutonniere deformity (Fig. 5)

MCP Joint Hyperextension Deformity

“Claw hand deformity”: hyperextension of MCPs with flexion of PIPs
Severity may be depend on extent of dorsal hand edema
Dorsal skin becomes taught and palmar arches flatten as edema

flows into the extravascular tissues

Tension is transferred to digital extensor mechanism with PIP flexion

High incidence occurring in 4th and 5th digits

Boutonniere Deformity

Most common deformity in hand burns.

Central extensor slip damaged, lateral bands allowed to migrate volar to the axis of motion in the PIP joint. PIP joint flexes which extends the distal IP joint

Most commonly seen in 5th digit

Occurs in dorsal hand and digital burns

Occurs in deep partial or full thickness burns

Causes:

Thermal injury - may be direct burn to extensor apparatus

Tendon ischemia - extensor tendon compressed between eschar and proximal phalanx with PIP flexion

Scar banding - volar to axis of PIP joint

Desecration of exposed extensor tendon from bacteria and infection

Involvement of extensor apparatus should be assumed and protected until viability of tendon is confirmed

PIP Flexion Deformity

Occurs from long term dorsal post burn edema with MP hyper extension and PIP flexion

Can occur secondary to deep burns and scar contraction on the volar or lateral surfaces of digits or palm

Mallet Finger

Loss of DIP extension from injury to terminal slip of extensor tendon

Occurs with direct thermal injury

Burn over dorsum of the DIP joint often causes extensor tendon injury or detachment

Can occur secondary to tendon ischemia with injured tendon compressed between eschar and base of distal phalanx during DIP flexion

Swan Neck Deformity

Hyperextension of PIP joint with flexion of DIP joint

Most prominent in 3rd digit

May occur with scarring and contraction of non-grafted dorsal digital burn wounds

May occur from delayed skin grafting

May occur as a result of lateral digital scar tissue

Burn Syndactyly²

Deformity anticipated in any deep partial or full thickness injuries involving the dorsal hand

Can occur in any concave digital web surface where scar contraction pulled distally

Chapter 25: Burns

Missy Thurlow, MBA, OTR/L, CHT and Patricia Anderson, OTR/L, CHT

Loss of digital web spaces occurs secondary to burn wound contraction

As digital web spaces contract, width of the transverse volar arch of the hand is reduced, with loss of MP extension and finger abduction

Results in an inability to lay hand flat or cup hand in spherical grasp

First dorsal web space contracture results in limitation of thumb radial and palmar abduction, with scar band crossing web space and lateral index finger (Fig. 6)

Cupping of the Palm²

Occurs with deep burn to palmar surface of hand

Scar contraction pulls longitudinal and palmar arches together, increasing concavity of the palm

May include thumb flexion and adduction

Early prolonged positioning and orthotic use should help counteract this deformity and should include full extension of the wrist, palm and digits with the thumb extended and abducted. Low load, prolonged stretch counteracts this deformity

Scar Band Deformities²

Occurs with deep burns that contract leaving thick, tight scar bands

Scar contraction contributes to this deformity

Orthoses, elongation, and positioning the scar on stretch assist with reduction of scar banding.

May require surgery to release scar contracture

Often seen in delayed healing or full thickness burns (Fig. 7)

Scar Management²

Scar Development

Scar tissue begins during wound closure and is the result of collagen synthesis through myofibroblasts.

Myofibroblasts usually present around day 3 of the burn and assist with contracting the wound to a smaller size to expedite healing.

Severity of Scar Development⁹

Burn depth dependent - 1st degree: no significant scar tissue, 2nd and 3rd degree: may result in significant scar tissue, will require pressure therapy application

Healing time - if less than 2 weeks healing time usually see minimal scar tissue. 3 weeks or more produces significant scar tissue and requires pressure garments.

Pediatrics vs Geriatrics - Younger patients at risk for more scar development than older patients

Skin tones - Darker skin tones usually produce greater scar tissue with potential for keloid scars

Prolonged inflammatory wound healing phase will usually produce hypertrophic scarring

Superficial partial thickness burns result in blistering, painful

Chapter 25 Figures



Fig. 5 First web space contractor secondary to scar contraction.



Fig. 6 Palmar burn injury with web space syndactaly.



Fig. 7 Contact burn with split thickness skin grafting - loss of palmar arch, web space contract, cupping of palm.

Chapter 25: Burns

Missy Thurlow, MBA, OTR/L, CHT and Patricia Anderson, OTR/L, CHT

wounds that should epithelialize within two weeks without complications.

Deep partial thickness burns have less blistering, are painful and may take up to three weeks or longer to heal. Significant scar risk is noted.

Full thickness burns destroy the epidermis and dermis and result in less painful burn wounds but may have necrotic eschar with high risk of scarring noted.

Scar Evaluation⁸

Often subjective, done by the clinician. Therapist observes:

Height of the scar: raised or flat

Pliability of the scar; categories include normal, supple, yielding, firm, rope or contracture

Vascularity assessed based on color: normal tone, pink, red, or purple

Other evaluations include pain, stiffness, scar thickness or itching

Decision regarding pressure garments for scarring based on scar evaluation

Objective measurements using specific instruments are not commonly used

Pressure Therapy

Interim pressure therapy may be needed for red raised wounds or grafted areas with delayed healing. Interim pressure garments include: Tubigrip or compressive bandages such as ace wraps apply initial pressure to area. Silicone gel or inserts may be placed inside pressure garments for more effective pressure.

Custom pressure garments⁸

Indicated for raised, red and deep second and third degree burns.

Garments are custom measured. Several companies provide burn garments: Jobst and Bioconcepts are best known manufacturers.

Garments worn 23 hours per day to provide optimal pressure.

Patients are remeasured for new garments every 3-4 months to provide appropriate fit as burns change.

Garments should be worn a minimum of 6 months and upward of 2 years depending on scar maturation.

Garments may be fabricated with zippers to minimize shearing to recently healed grafts and to assist with donning and doffing of the garment.

Gloves with open fingertips allow use of the hands during ADLs

X. Return to Work/School^{7,8}

Work

May benefit from work simulation and work conditioning

Intolerance to extreme temperatures is common after burn injury therefore hot or cold environments should be avoided

- Pressure garments should be worn to work
- Sunscreen should be applied to minimize skin discoloration with sun exposure
- May need work accommodation based on work site evaluation
- May benefit from initial return to work part time with progression to full time
- Surgical intervention may be needed in the future, employer must be made aware
- May benefit from Work Capacity Evaluation
- Analysis of potential barriers should be identified prior to return to work
- Provide psychological intervention if needed

School^{7,8}

- Pressure garments should be worn to school
- Classes and teachers should be notified of student returning
- May include adaptation of school work, depending on hand function
- Analysis of potential barriers should be identified prior to return to school
- Psychological intervention
- Support of family, therapy team and school teachers necessary for successful return

Chapter 25: Burns

Missy Thurlow, MBA, OTR/L, CHT and Patricia Anderson, OTR/L, CHT

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Multiple Choice Questions

1. An African – American patient has a severe burn on his shoulder that requires split-thickness skin grafts. After several months, the patient develops large raised keloid areas. What would be a good course of practice for this person?
 - A. Provide stretching and attempt to remold the scar with Tubigrip
 - B. Silicone gel for nighttime wear to decrease the scarring
 - C. Referral back to the physician for immediate surgery
 - D. Provide pressure garments with 30 mmHg of pressure to attempt to decrease the keloid scar
2. A therapist fabricates an orthotic for a severe hand and wrist burn that requires daily dressing changes and has severe edema. The orthotic will initially be held in place with:
 - A. Soft straps
 - B. Velcro straps
 - C. Ace wraps
 - D. Coban wrap
3. A patient has healing areas that appear hypertrophic. These burns most likely took over:
 - A. 3 weeks or more to heal
 - B. 2 weeks to heal
 - C. 1 week to heal
 - D. Healed quickly
4. A person with a full thickness circumferential burn to the forearm, elbow and upper arm would most likely benefit from an orthosis that:
 - A. Positions the elbow in – 30 degrees of extension
 - B. Positions the elbow in full extension
 - C. Positions the elbow in 90 of flexion
 - D. No orthosis indicated
5. A 50% TBSA burn patient s/p skin grafting is doing well and is ready to return to work in the construction field. It is most important that the person:
 - A. Protects the burn areas with a long sleeve shirt
 - B. No special care is needed
 - C. Completely avoid contact with sunlight for 12 months
 - D. Protects healed burn areas with sunscreen and understands sweating ability may have been affected
6. A patient needs a custom pressure garment for the hand. The patient does not have full digital mobility and will need assistance donning the glove. The best option/modification for this glove is to:
 - A. Order a non custom edema glove from a catalog until the patient can manage getting the glove off and on independently
 - B. Provide a garment with less pressure to assist in application
 - C. Provide a zipper on the dorsum of the glove to assist with application
 - D. Use Tubigrip and coban wrapping to increase ease of application and to provide some pressure

Chapter 25: Burns

Missy Thurlow, MBA, OTR/L, CHT and Patricia Anderson, OTR/L, CHT

Multiple Choice Questions

7. During the initial phase of edema post-burn (48-72 hours):
 - A. AROM and gentle PROM are encouraged
 - B. AROM should not be done
 - C. Compression is used to control edema
 - D. Only AROM is done
8. The purpose of an orthosis for an acutely burned hand is to:
 - A. Assist with edema control
 - B. Prevent contractures
 - C. Promote venous blood and lymph return into the central circulation
 - D. Immobilize the hand to promote healing
9. Remodeling scar tissue is best accomplished by:
 - A. Remodeling of collagen into less organized pliable alignment
 - B. Increasing patient's tolerance to forceful stretching
 - C. Increasing vascular supply to aid in tissue healing
 - D. Low load sustained pressure
10. The following is common for managing burn scar:
 - A. Compressive dressing
 - B. CPM
 - C. Electrotherapy
 - D. Blocking exercises
11. Scar management begins when:
 - A. Edema is under control
 - B. Skin is closed with only small open wounds remaining
 - C. Open areas require daily dressing changes
 - D. The patient expresses concern over the appearance of the scar
12. The term scar syndactyly refers to:
 - A. Web space scar that results in decreased digital abduction
 - B. The production of microscopically similar collagen in the different layers of healing tissue
 - C. Scars on adjacent digits that result in similar functional deficits
 - D. The type of scar resulting from a hand burn requiring safe position orthotics
13. The best predictor for determining if a burn wound will form hypertrophic scarring is:
 - A. Race
 - B. Burn depth
 - C. Age of the patient
 - D. Length of time to wound closure

Multiple Choice Question Answer Key Chapter 25

1-D, 2-C, 3-A, 4-B, 5-D, 6-C, 7-A,
8-B, 9-D, 10-A, 11-B, 12-A, 13-D