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Core Curriculum for Plastic Surgical Nursing

Dermal Fillers

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PURPOSE

The dermis is composed of two important substances: a loose network of *collagen fibers* within an interstitial substance composed largely of *hyaluronic acid* (HA). With advancing age, the skin's collagen framework weakens and the skin loses its elasticity. The skin cells also decrease their ability to produce HA. This results in the formation of lines and furrows on the face that may be successfully treated with a dermal filler. Collagen provides tensile strength to the dermis by forming a framework in which new cells can grow. HA is a polysaccharide, which has the ability to attract water. Water is necessary to keep the skin plump and moisturized. These two substances, collagen and HA, are commonly found in dermal fillers.

Injectable collagen was developed in the early 1970s and was made from purified bovine skin. In 1981, the Food and Drug Administration (FDA) approved the injection of collagen for the treatment of wrinkles, smile and frown lines, acne, and postsurgical scars. In 2003, the FDA approved the use of human collagen and HA-based products, therefore eliminating the need for a skin test and allowing the patient a same-day treatment option.

The injectable filler market is being flooded with new and improved products. There is not one product that can be indicated for all treatment areas. This article touches on just a few of the products available and does not represent a complete list of available products nationally and internationally.

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OBJECTIVES

On completion of this section, the learner will be able to

1. discuss the importance of understanding the anatomy of the skin when performing dermal fillers.
2. explain the difference between the products that are available in the market today.
3. describe the important steps in the consultation process to ensure patients are well informed about the treatment choice.
4. identify the contraindications for each product choice.
5. identify the various injection techniques that may be used when injecting a dermal filler or a combination of dermal fillers.
6. identify the risk of potential complications of dermal fillers.

CONTENT OUTLINE

I. Anatomy of the Skin

A. Normal, healthy skin can be described as having three basic layers:

1. Epidermis
   a. Stratum corneum: Top layer of dead skin cells providing a protective horny surface.

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b. Squamous cells: Living epidermal cells. New cells are produced in the basal layer.
2. Dermis: Supporting layer, contains blood vessels, nerve endings, collagen, elastin, and HA.
3. Subcutaneous: Fatty layer providing cushioning.

B. Characteristics of the gradual process of aging

1. Skin loses its ability to retain moisture.
2. Sweat and oil gland activity decreases, and the skin becomes dry and itchy.
3. Fat in the subcutaneous layer becomes less dense as it is redistributed in the stretched skin. Dryness accentuates the wrinkles, as does the natural redistribution of the fat in the subcutaneous layer.
4. Collagen and elastin fibers lose elasticity, and the skin sags and wrinkles.
5. HA is a polysaccharide that has the ability to attract water, therefore keeping the skin plump and hydrated. With advancing age, the skin cells have decreased production of HA, which leads to the formation of fine lines and folds.
6. Cell production is slowed, so the horny, protective layer of the epidermis is thinner and provides less protection from the elements.

II. Dermal Fillers

A. Human collagen: A natural human collagen that is purified from living, dermal tissue grown under sterile, controlled laboratory conditions. Because it is human based, it does not require a skin test and contains lidocaine to minimize patient discomfort.

1. CosmoDerm
   a. 35 mg of human collagen and 0.3% lidocaine
   b. Injected into the papillary dermis by using the serial puncture technique and injecting at a 10° to 25° angle.
   c. Indicated for superficial lines such as perioral lines or peri-orbital lines or as an overlay on top of CosmoPlast.

2. CosmoPlast
   a. 35 mg of human collagen, cross-linked with glutaraldehyde and 0.3% lidocaine
   b. Injected into the mid to deep reticular dermis, with use of a serial puncture technique and injecting at a 45° angle.
   c. Indicated for deeper lines and furrows, lip augmentation.

3. Contraindications
   a. Sensitivity to lidocaine.
   b. Severe allergies manifested by a history of anaphylaxis.
   c. History of allergy to any collagen product.
   d. Auto-immune disease such as rheumatoid and/or psoriatic arthritis, scleroderma, lupus erythematosus, polyarthritis, dermatomyositis, and polymyositis.
   e. Pregnancy or lactation.
   f. Active acne or facial herpes simplex present at desired injection site.

B. Hyaluronic acids: HA, a glycosaminoglycan, is a naturally present substance in skin and is needed to reconstruct tissues and maintain tissue hydration. One of the benefits of HA is that it is biocompatible—naturally occurring—in the identical form, in the intercellular space of the dermis of all species; therefore, a person cannot be allergic to the product. Sensitivity reactions have been reported but not an allergic reaction. HAs may be produced by HA in rooster combs (Hylaform products) or by bacterial fermentation (Restylane, Perlane, and Juvederm products). All of the hyaluronic products have water-attracting properties.

1. Restylane products. All of the products have a concentration of stabilized HA (20 mg/ml) but differ in terms of gel particle size. Products are produced by bacterial fermentation. Restylane was approved by the FDA in December 2003. Perlane was approved by the FDA in May 2007.
   a. Restylane Fine line—500,000 gel particles/ml. Indicated for thin and delicate wrinkle areas.
   b. Restylane—100,000 gel particles/ml. Indicated for moderate wrinkles to smooth out scars and to add volume to lips.
   c. Perlane—10,000 gel particles/ml. Indicated for deeper wrinkles and lip enhancement.
   d. Restylane SubQ—1,000 gel particles/ml. Indicated for deep subcutaneous and/or supraperiosteal injection for facial augmentation.

2. Hylaform products. All products have a concentration of 5.5 mg/ml, but they differ in particle size. They are produced from rooster combs.
   a. Hylaform Fineline—particle size 200 μg. Indicated for fine lines and wrinkles.
   b. Hylaform Regular—particle size 300 μg. Indicated for moderate folds and surface irregularities.
   c. Hylaform Plus—particle size 700 μg. Indicated for deeper folds, oral commissures, and lip enhancement. Captique is similar to Hylaform Plus but is produced by bacterial fermentation.

3. Juvederm products. Difference in the line of products is due to the number of cross-links. The high-viscosity (HV) products have an increased number of cross-links, which increases the persistence and longevity of the product. Juvederm Ultra and Juvederm Ultra Plus were approved by the FDA in June 2006.

a. Juvederm 18 (18 mg/ml) is indicated for fine wrinkles such as peri-orbital and peri-oral lines. It is injected into the superficial dermis.
b. Juvederm Ultra 24 and Juvederm 24HV (24 mg/ml) are indicated for moderate wrinkles such as glabellar lines, forehead wrinkles, moderate nasolabial furrows, cheeks, and lip contour. They are injected into the mid-dermis with a 30- or 27-gauge needle.
c. Juvederm Ultra Plus 30 and Juvederm 30HV (24 mg/ml) are indicated for deep wrinkles and lips such as deep nasolabial furrows and the body of the lip. They are injected into the deep dermis with a 27-gauge needle.

C. Radiesse: Composed of an aqueous gel (glycerin, sodium carboxymethylcellulose, water) and calcium hydroxylapatite (an inert matrix material found in both bone and tissue).

1. Indications: Material was approved by the FDA in June 2006 for deep facial lines and folds and lipoatrophy.
2. Longevity is approximately 9 to 18 months.
3. Material is nonallergic, therefore skin test not necessary before treatment.
4. Placement is in deep dermis or subcutaneous junction with a 26- or 27-gauge needle.
5. Instruct patient to limit movement in the injected area for 48 to 72 hr to allow time for the implant to settle and fibroplasia to take effect.
6. Some early loss of correction may occur during the first 8 weeks because of absorption of the gel that is the carrier of the calcium hydroxylapatite. A touch-up treatment may be required to achieve optimal results.

D. Sculptra: Polymerized lactic acid in a powdered lyophilized form

1. Indications: Material is FDA approved for AIDS-related facial lipoatrophy and other defects needing volumetric improvement.
2. Longevity is approximately 2 to 4 years.
3. Reconstitution consists of the following procedure.
   a. The powdered material is reconstituted with 4 ml of sterile water into a suspension.
   b. Allow suspension to stand at room temperature for at least 2 to 4 hr.
   c. Immediately before use, 1 ml of 1% lidocaine is added to the suspension.
   d. Syringes are then shaken and rotated to ensure as uniform a suspension as possible.
4. Material is injected into the deep dermal/subcutaneous junction by using a 26-gauge needle.
5. Do not overcorrect because there may be a delayed fibroplastic response to the injection.
6. Side effect could be a reactive nodule that may require intra-lesional corticosteroid injection and massage of the affected area.

E. Artefill: Polymethyl methacrylate microspheres. Approved by the FDA in 2006.

1. Bovine collagen (0.3% lidocaine): Indications—for deep folds, oral commissures, and surface irregularities. The body reacts to the polymethyl methacrylate spheres that are injected by encapsulating them with connective tissue. This degree of reactivity determines the amount of correction from each treatment. This encapsulation process may take 3 months, and then a repeated treatment may be necessary to complete the correction. Patients must be warned about the possibility of nodule and/or granuloma formation as a complication of this treatment.
2. Contraindications
   a. Positive reaction to collagen skin test, usually done on the upper, inner aspect of the forearm.
   b. Allergy to lidocaine.
   c. Patients presenting with thin, flaccid skin.
   d. Known, active immune disease.
   e. Susceptibility to keloids.
   f. Current treatment with steroids.
3. Adverse reactions: Nodule or granuloma formation. May be treated with intra-lesional steroids or direct excision.
4. Injection technique is as follows:
   a. The product is placed in the deep dermis with use of 27- or 26-gauge needle.
   b. It is injected in a tunneling fashion, keeping the needle moving at all times.
   c. Gentle massage to avoid placing too much product in one area.

III. Patient Consultation and Assessment

A. Consultation: The concept of a dermal filler injection being a lunch-hour treatment is a great marketing tool, but the client must be warned of the postinjection reactions that may occur with all the injections. Although makeup may be applied 30 min after the injection, there still may be some residual evidence of the treatment.

1. Thorough medical history must be obtained to rule out any contraindications to the treatment.
2. Patient has areas of fine lines, furrows, or scars that pass the stretch test and contour irregularities that would benefit from dermal filler treatment.
3. Discuss the various options for anesthesia—topical creams or the use of local infiltration. If patient presents with a cardiac history, do not use an infiltration containing epinephrine.

4. It is recommended to discontinue aspirin, aspirin-like products, nonsteroidal anti-inflammatory drugs (NSAIDs), vitamin E, and alcohol a few days before the treatment to minimize bruising and swelling.
5. Patient understands the concept of "full correction" and is motivated enough to return for follow-up treatments.
6. Patient has realistic expectations, understands that results of dermal filler injection are not permanent.
7. Patient is prepared to accept the financial responsibility of ongoing treatment.

B. Contraindications: Check the manufacturer's package insert for contraindications specific to each product.

1. Do not inject the peri-oral area in patients exhibiting symptoms of a cold sore.
2. Product must not be used in areas presenting cutaneous inflammatory and/or infectious process (acne).
3. Use cautiously in association with laser therapy, chemical peeling, intense pulsed light therapy, or dermabrasion. This is at the discretion of the injector.
4. Product must not be used in
   a. patient with a history of anaphylactic reactions.
   b. patients in whom hypertrophic scarring tends to develop.
   c. patients with a history of auto-immune disease or who are receiving immune therapy.
   d. patients who are known to be sensitive to any of the product ingredients.
   e. women who are pregnant or breast-feeding.
   f. children.
   g. patients with sensitivity to lidocaine when using dermal fillers containing lidocaine (i.e., CosmoPlast).

IV. Treatment

A. After a thorough discussion of the indications, contraindications, treatment expectations, and ostinjection protocol, have the patient sign a consent form, which is also signed by the injection technician and the supervising physician.
B. Take clinical photographs for the patient documentation.
C. During the assessment, point out to the client, using a mirror, any pre-existing asymmetries or irregularities and document on the treatment record.
D. Patients frequently forget their pre-operative appearance. Pre-operative and postoperative photographs are recommended.
E. Cleanse area well with alcohol or another antiseptic solution.
F. Small amounts of fillers are injected into the dermis to provide a framework into which new cells can grow (collagen) or to provide volume (HAs).
   a. The amount injected depends on the depth of the wrinkle or the volume desired.
   b. Do not overcorrect unless using CosmoDerm or CosmoPlast.
   c. Injection technique depends on the area to be injected and product chosen.
      i. Linear retrotracking or threading. In the linear threading technique, the full length of the needle is inserted under the wrinkle and the product is injected while pulling the needle slowly backwards. Care must be taken to stop injecting before the needle is completely removed.
      ii. Serial puncture. In the serial puncture technique, multiple injections are made along the wrinkle in a smooth continuous line. It is important to massage the treated area to ensure even distribution of the product.
      iii. Superposition. The superposition technique involves treating the deep and superficial dermis simultaneously or in successive treatments.
      iv. Fanning. This technique is commonly used when injecting the nasolabial fold at the angle of the nose and/or the marionette lines. The full length of the needle is inserted and product is injected while pulling the needle backward. When you are about to see the level of the needle, change the angle of the needle, reinsert, and inject product while pulling backwards. Continue this fanning motion until the defect is properly corrected.
      v. Cross-hatching. This technique involves performing a homogeneous coverage of the treatment area.
J. Gently massage each treated area after injecting to ensure even distribution of the product.
K. A second treatment may be necessary 2 to 4 weeks after initial injection to provide a complete correction.

V. Nursing Implications

A. These products are not indicated for injections other than intra-dermal injections.
B. There are no available clinical data (efficiency, tolerance) about injection into an area that has been treated with another filling product.
C. Patients need to be reminded that these treatments are temporary.
D. Erythema, swelling, and local tenderness may last for 24 hr.
E. If a patient needing a peri-oral treatment has had a cold sore in the past but not within the past 4 weeks, the provider may prescribe an anti-viral

medication to be started a day before the injection and continue medication afterwards (as per physician's order).

F. Risk of bruising is increased with use of NSAIDs, vitamin E, aspirin, or other blood thinners. Always warn patients of the risk of bruising and suggest their treatment be 1 week before an important event.

G. Palpable lumpiness or visible material is temporary with the temporary dermal fillers. Nodules or granulomas may result from the permanent or semi-permanent products that may necessitate steroid injection or surgical excision.

H. Longevity of product depends on product, the amount of product injected, area of injection, and the strength of mimicry.

I. Sensitization reactions occur in 1% to 2% of treated patients. These consist of erythema, swelling, induration, and/or urticaria.

VI. Potential complications

A. Partial loss of vision

1. Cause: Injection into blood vessel
2. Incidence: Very rare 1:1,500,000 (Collagen Corporation, 1985)
3. Signs and symptoms: Loss of vision in one eye
4. Implications: Alterations in patient's lifestyle
5. Management: rehabilitation and therapy

B. Scab or scar formation

1. Cause: Injection into blood vessel
2. Incidence: Rare
3. Signs and symptoms: Scab at injection site; itching
4. Implications: Scar formation
5. Management: Encourage patient to avoid scratching the area

C. Infection

1. Cause: Bacteria introduced by needle
2. Incidence: Minimal—fewer than 1:1,000
3. Signs and symptoms: Redness, sloughing of skin, purulent drainage
4. Implications: Scar formation; systemic involvement
5. Management: Anti-biotic therapy; hygiene instruction; possible skin graft.

D. Herpes eruption

1. Cause: Previous outbreak at injection site
2. Incidence: Seldom—fewer than 1:10,000
3. Signs and symptoms: Herpes blisters
4. Implications: Possible spread of herpes; scar formation
5. Management: Topical ointments, anti-viral medications, and hygiene instruction to prevent spread. Thorough pre-treatment evaluation.

E. Allergic reaction

1. Cause: Unknown
2. Incidence: 3:10,000 (Collagen Corporation, 1985)
3. Signs and symptoms: Nausea, rash, swelling, headache, dyspnea
4. Implications: Continued symptoms, possibly leading to anaphylaxis
5. Management: Discontinue injections; anti-histamines

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SUGGESTED READING

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