

Toxicity & systemic complications in plastic surgery practice

Myth & Reality

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The quest for beauty is ancient





Non-invasive Alternatives

Generally very safe

Daily evolving

No single best answer

Very profitable business





Adverse Effects in Plastic Surgery

Local *rather than* general

Aesthetic *rather than* systemic

Toxicity is Very rare



A close-up, artistic photograph of a person's face, focusing on the eyes and lips. The eyes are brown and looking slightly to the right. The lips are pink and slightly parted. The background is a soft, out-of-focus light color.

Topical agents

Injections

Implants

Indications

Anti-Aging

- Wrinkles (Dynamic / Static / Gravitational) --- (Botox / Fillers)
- Loss of volume --- (Fillers)
- Gravitational descent
- Bone resorption

Skin Problems

- Pigmentation --- (Chemical Peeling)
- Post Acne Scarring --- (Chemical Peeling)

Lipolysis --- (Mesotherapy / Injection Lipolysis)

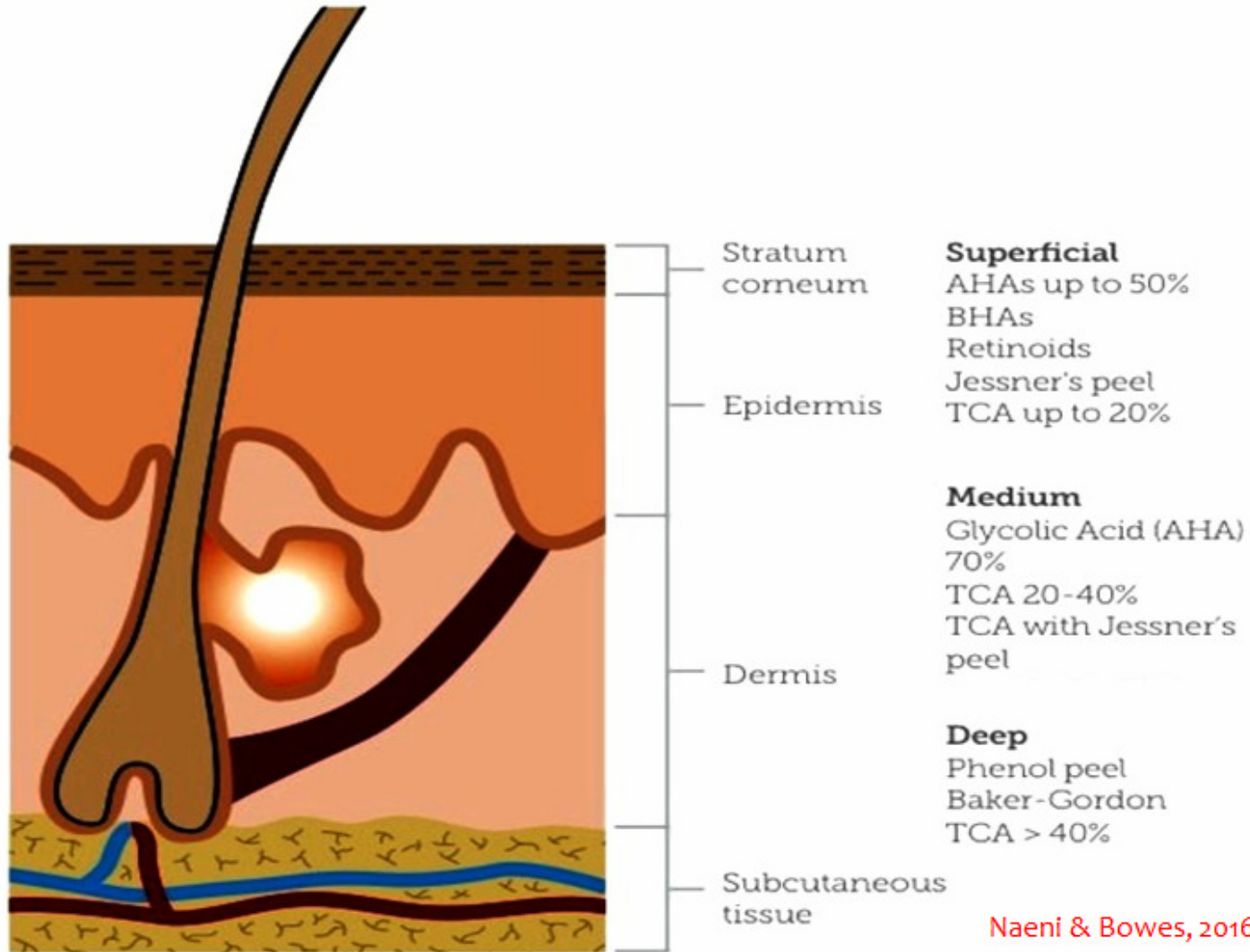
Hair Problems --- (Mesotherapy)



Chemical Peeling



Chemical Peeling



Naeni & Bowes, 2016



Chemical Peeling

Phenol & Resorcinol Toxicity

- Cardiac arrhythmias
- Renal Failure
- Hepatic Failure
- Thyroid dysfunction



Chemical Peeling

Phenol & Resorcinol Toxicity

70% absorbed within 30 minutes

- 25% Metabolized into $\text{CO}_2 + \text{H}_2\text{O}$
- Excreted unchanged
- Conjugated with glucuronic acid
- Oxidized into hydroquinone



Chemical Peeling

Phenol & Resorcinol Toxicity

- Dependent on Surface area treated
- Dependent on concentration?

Chemical Peeling

Phenol & Resorcinol Toxicity

Signs of toxicity during peel

- Nausea & vomiting
- Paraesthesia
- Headache
- Arrhythmias
- CNS stimulation: tremors, hyperreflexia, hypertension followed by CNS depression

Chemical Peeling

Phenol & Resorcinol Toxicity

Management

- To Avoid is better than to treat
- Use other peeling agents
- Use in combination solutions (↓↓ Conc. / Oily solutions)

Baker-Gordon's Formula – Jessner's Solution

- Discontinue for 15 minutes if mild S.V. tachycardia
- Abandon if more severe tachycardias



Botox



JANUARY 16, 2017

TIME

Depression.
Heart trouble.
Migraines.
Erectile dysfunction.
Back pain.
Sweaty palms.
Drooling.
And 793 other problems.

How Botox Became the Drug That's Treating Everything.

By Alexandra Sifferlin



Nature

Botox is a toxin produced by the bacteria “*Clostridium botulinum*”

This bacteria produces 7 types of botulinum toxin (A-G)

Only Types A & B can affect human muscles

Actions

- Prevents acetylcholine release at neuromuscular junction (Muscle paresis)
- Prevents acetylcholine release at autonomic cholinergic nerve endings (Sweating)

Action takes 2-3 days but may be as long as 5 days in 3 stages

Binding

Internalization

Lysis of Acetylcholine vesicles

Preparation

Botulinum toxin A (BOTOX®) arrives on dry ice and must be stored frozen at lower than -4°C .

One unit is defined as the **median lethal dose** in mice. The **MLD** in humans is estimated at 3000 U.

It comes in a 100-u bottle.

Toxin is mixed with 2.5 mL of 0.9% saline, creating a concentration of 40U/mL



Indications of Botox Injections

Cosmetic

Hyperfunctional lines (Dynamic wrinkles)
(glabellar, forehead, crow's feet, platysmal bands, perioral & bunny lines)

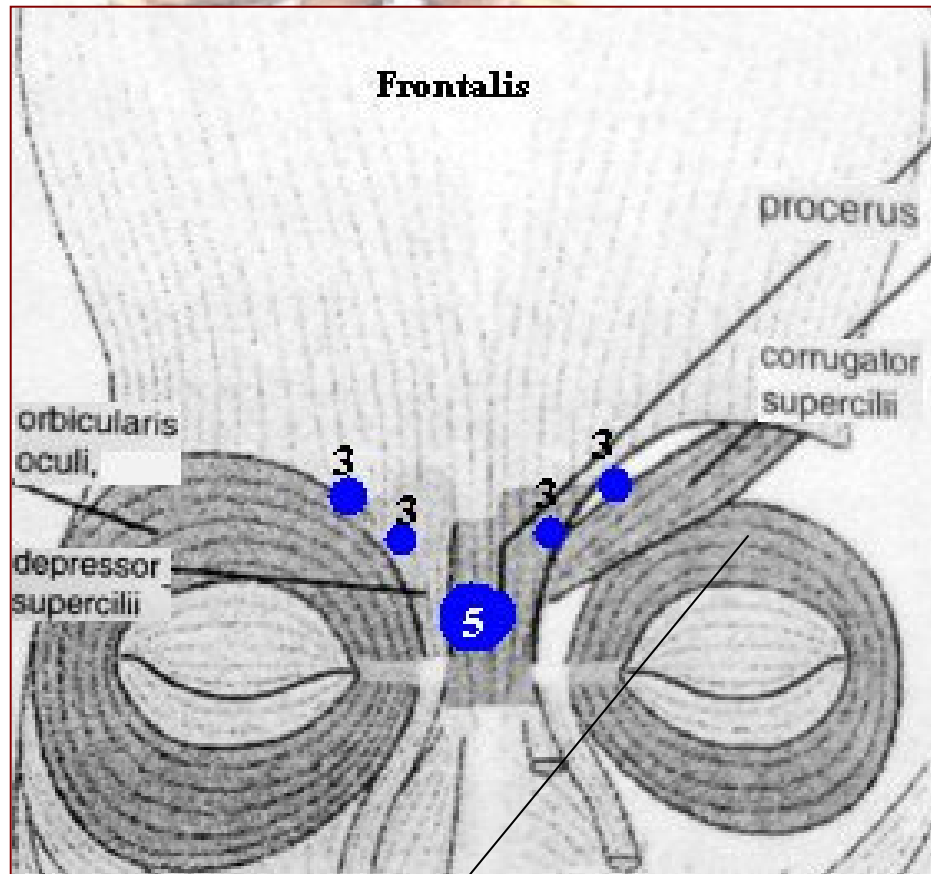
Therapeutic

- *Hemifacial spasm*
- *Post-Bell palsy synkinesis*
 - *Blepharospasm*
- *Spasmodic dysphonia*
 - *Strabismus*
- *Cervical dystonia*
 - *Frey syndrome*
 - *Achalasia*
 - *Hyperhidrosis*
 - *Sialorrhea*
 - *Migraines*
- *Chronic Anal Fissure*

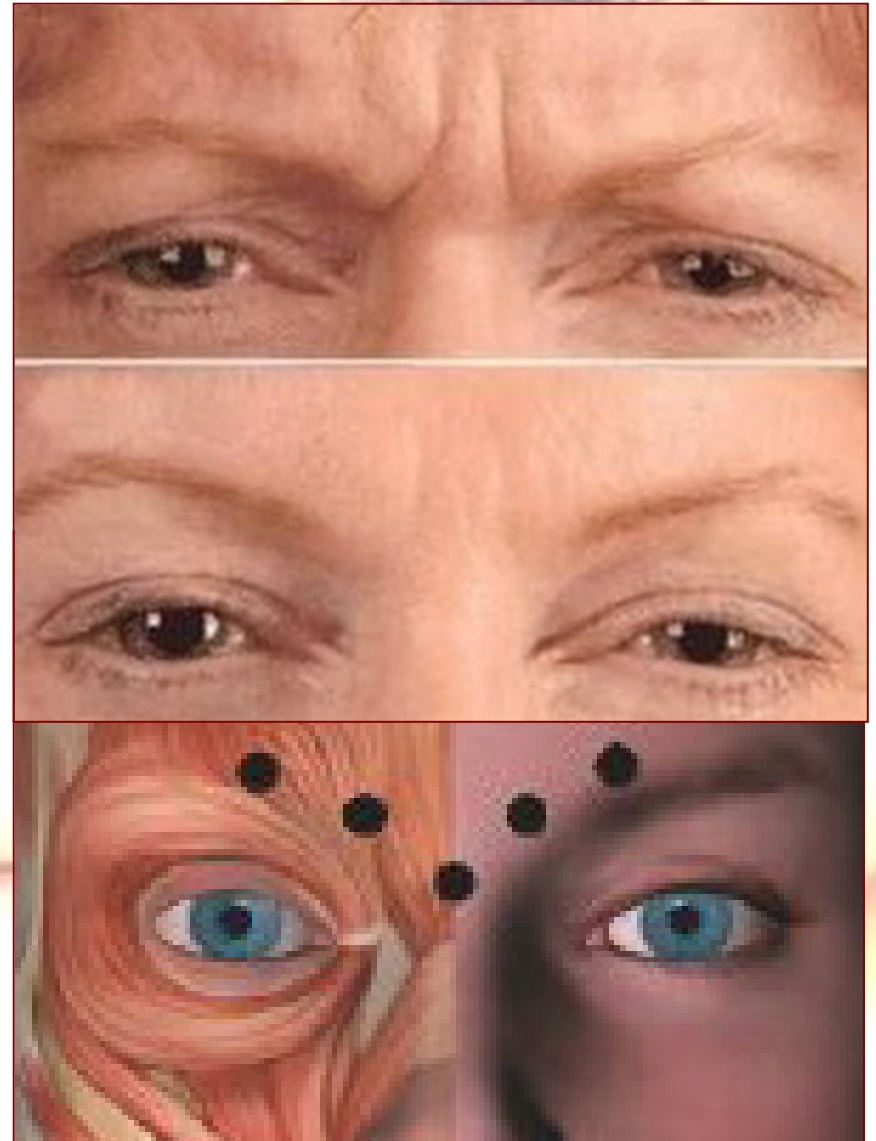
Contraindications of Botox

- Pregnancy
- Lactation
- History of reaction to toxin or albumin
- Preexisting motor neuron disease (eg, myasthenia gravis)
 - Age younger than 12 years
 - Infection at the injection site
- Coincident administration of aminoglycosides can potentiate paralysis (**relative**)

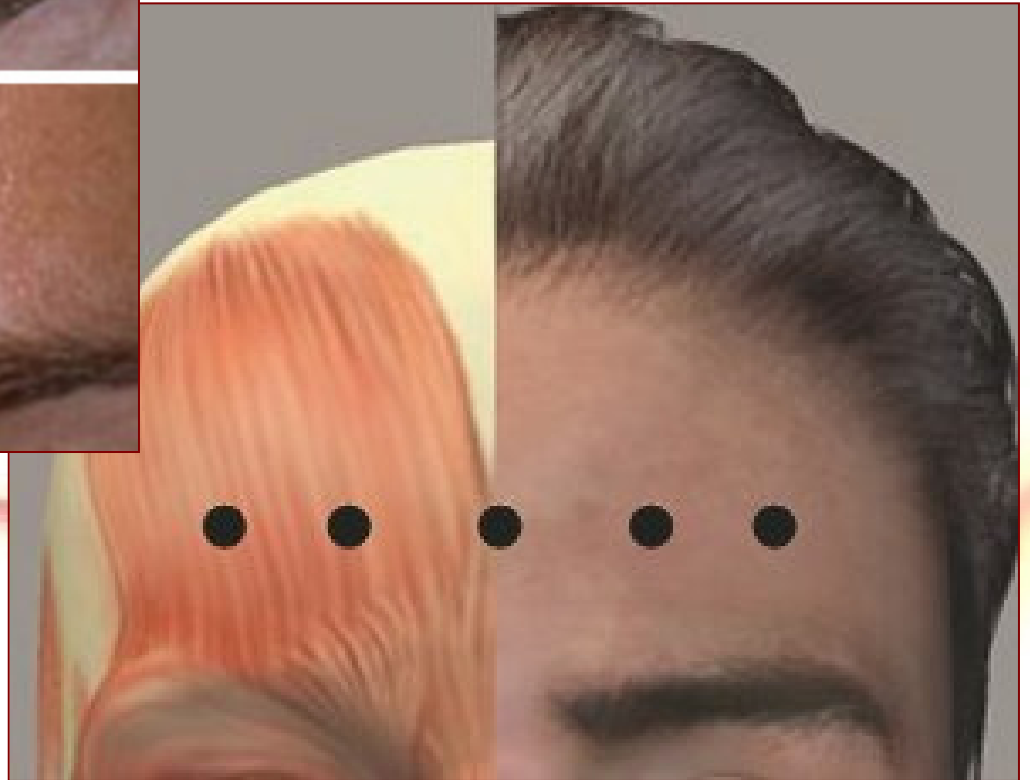
Glabellar Lines



Ptosis



Forehead Lines



Forehead Lines “Mephisto sign”

Especially in **MEN**

Do not paralyze muscles completely

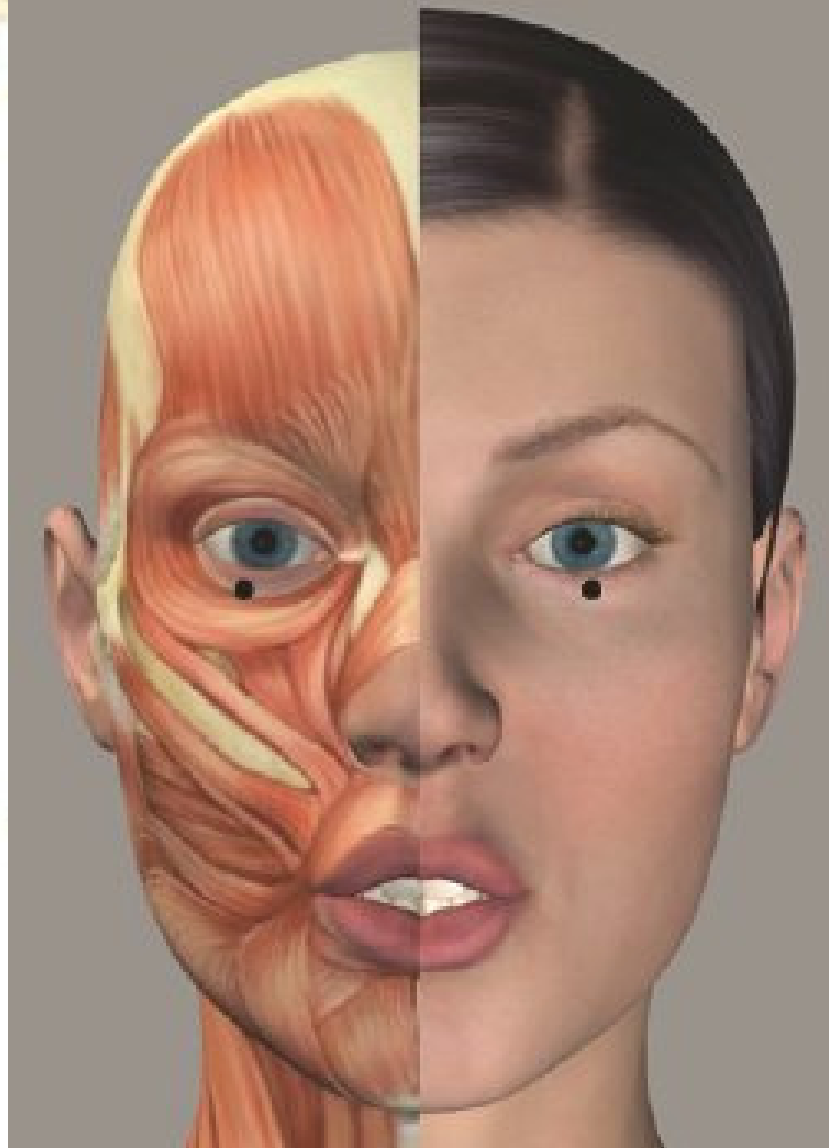
Do not restrict injection to mid-pupillary area



Crow's feet



Lower Lid



BROW LIFTING



Bunny Lines

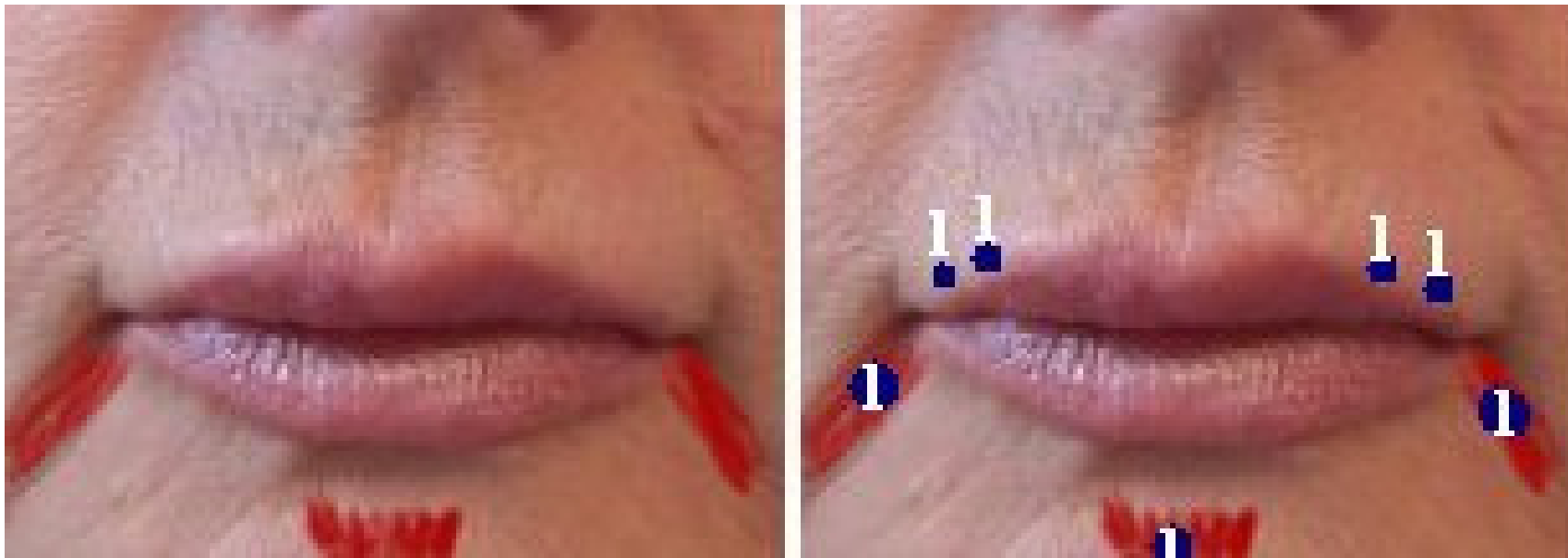
Procerus & Nasalis action



Perioral Lines

Over Treatment may lead to Loss of Letters Ps & Bs, drooling and Mouth incompetence
Injection of depressor very close to mouth can cause drooling and Mouth incompetence

If you combine Fillers with Botox, inject fillers first to avoid moving of Botox

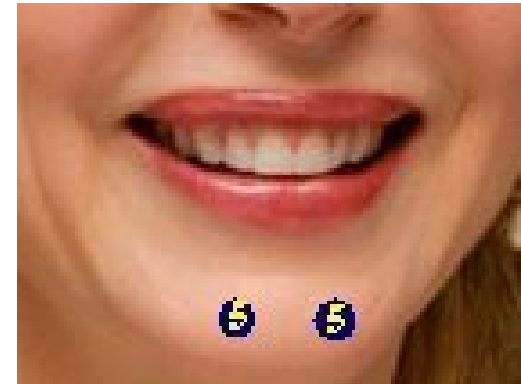


Chin

MENTALIS Muscle

Inject too low or just below tip or prominence of chin

If mentalis is hypertrophic do not inject (oral incompetence highly likely)



Platysmal Bands

AVOID STRAP MUSCLES (by grasping band and injecting directly into muscle)

Inject multiple points per band for better results

Injection may be superficial allowing botox to diffuse into muscle

Inject 2-12 points/band

with a maximum of 10-30 Units in females and 10-40 in males





COMPLICATIONS

Adverse Side Effects Due to Injection

Pain / Bruising / Headache / Eye dryness

Adverse Side Effects Due to Local Diffusion/Distribution

Ptosis / Ectropion / Strabismus / Pseudo Herniation of Lower Lid Fat / Dysphagia / Horseness

Adverse Events Due to Hyperactivity of Adjacent Muscles / Brow Malposition

Allergies to Botulinum Toxin-A

Formation of Antibodies

Botulism ???



Fillers





Facial Fillers

Implants or Drugs?



Synthetic Fillers

(HA fillers, Non-HA fillers including Collagen)

Autologous Fat

Facial Implantables *(AlloDerm & Gore-Tex)*

Facial Implants





Synthetic Fillers

- Collagen
- Hyaluronic Acid
- No C/HA **with** non-absorbable microspheres (Sculptra & Radiesse)
- No C/HA **without** non-absorbable microspheres (Laresse)
- Collagen **with** non-absorbable microspheres (Artefill)



Hyaluronic Acid

- *Naturally occurring Polysaccharide (Sugar) present in skin more In dermis than epidermis*
- *It has the ability to bind to large quantities of water (1 gm can bind up to 3 liters of water)*
- *Excellent lubricant which aids Cell mobility*

Bacterial based (Restylane & Juviderm 4000-6000 monomers)

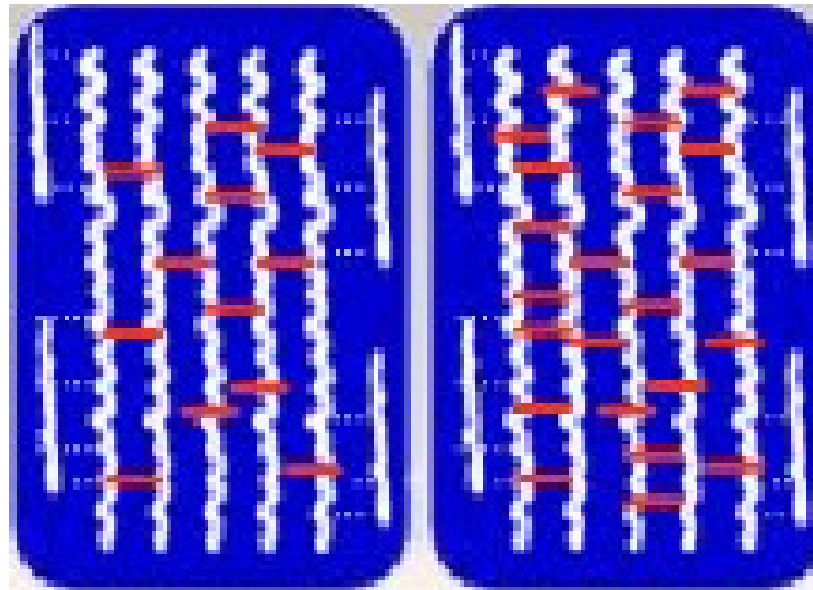
Animal based (Hyalform 10000-15000 monomers)

No Significant Difference



Hyaluronic Acid

- Formed of polymers each resembling a chain composed of repeating units of smaller molecule called monomers
- When these chains are bound together by glycosaminoglycan crosslinkers it is called Cross-linked HA





Hyaluronic Acid

WHY does it contain both cross-linked and Non cross-linked HA

-Non cross-linked component aids extrusion and flow but is rapidly degraded

-Cross-linked component provides persistency but decreases gel softness and ease of injection

Hyaluronic Acid

Important Parameters affecting performance of HA fillers

- Total HA Concentration per ml (range: 8-27 mg/ml)
- Percentage of crossed linked HA of the Total HA concentration (range: 0-90%)
- Degree of cross-linkage (number of cross-linkers between HA chains)
- Gel consistency: Smooth (eg. Juviderm) or Granular (eg. Restylane)
- Gel hardness
- Degree of hydration of HA chains



Hyaluronic Acid

Degree of Hydration of HA Chains

When HA chains are near Equilibrium Hydration their ability to bind water is minimal (What you inject is what you get) e.g Hyalform

When HA chains are far below Equilibrium Hydration they are more hungry for water e.g restylane & Juviderm

The Eraser

Hyaluronidase Enzyme



Non-HA Non Collagen Fillers

Famous examples: *Radiesse, Sculptra, Aquamid & Laresse*

A portion of non-resorbable beads or particles mixed in a carrier solution. e.g *Radiesse* uses ceramic beads and *ArteFill* uses plastic beads

The non absorbable component stimulates collagen synthesis

As a result, they last longer than the HA fillers even if 80 - 90% of the particulated filler does go away

Adverse effects and Limitations


- Lump formation due to scarring around beads
- Chronic inflammation in and around the injection site
- No eraser !!**

So their use in the lips is not recommended but they can be used deep at the bone level for temporary cheek, chin and jaw enhancement



Facial Fillers

Complications

- Accidental injection into a blood vessel
 - Granulomas
 - Hypersensitivity
 - Aesthetic Complications
- 




Mesotherapy & Injection Lipolysis





Mesotherapy Applications

1. Hair re-growth/alopecia
 2. Face and Neck rejuvenation/ mesolifting (**Mesolift or MesoGlow**)
 3. Localized fat reduction
 4. Cellulite reduction & Stretch Marks
 5. Body sculpting
- 

Mesotherapy for Hair Loss

- **Minoxidil:** Vasodilator that lengthens the Anagen phase by increasing Blood supply to the follicles ----- Headache
- **Dutasteride or Finasteride:** 5-AR inhibitor
- **Azelaic Acid:** 5-AR inhibitor
- **Zinc:** 5-AR inhibitor
- **Pyridoxine:** Vit B6 which potentates Zinc inhibitory Effect
- **D-Panthenol:** Vit B5 increases energy production in the follicles
- **Biotin:** Vti B7 or Vit H increases production of Fatty acids
- **Ginkgo Biloba:** Increases blood supply to follicles

Mesotherapy for Facial Rejuvenation

Materials Injected

Hyaluronic Acid

Vitamins

Amino acids

Minerals

Coenzymes

Nucleic acids

Mesotherapy & Injection Lipolysis

are they the same?

- **Ingredients**

Standard: *phosphatidylcholine (PPC)*

Non Standard: Active or Homeopathic

- **Injection Level**

Mesoderm (deep dermis) **or** Subcutaneous fat

Mesotherapy & Injection Lipolysis

	lipolysis	Mesotherapy
Standard Ingredients	phosphatidylcholine (PPC)	-----
Non Standard Ingredients	Active	Homeopathic
	<p>Sodium deoxycholate (DC) <i>A bile salt which emulsifies fat and facilitates its mobilization towards vascular system, used to keep PPC soluble and injectable, essentially keeping it in a liquefied solution</i></p> <p>L Carnitine <i>a nonessential amino acid necessary for fatty acids, to get into the mitochondria</i></p> <p>Rutin <i>Facilitates post-traumatic neoangiogenesis. It has anti-infectious effects.</i></p> <p>Yohimbe <i>Alpha 2 adrenergic receptor antagonist</i></p>	<p>Vitamins</p> <p>Minerals</p> <p>Aminoacids</p>

Phosphatidylcholine (PPC)

”The Miracle Molecule”

- An integral component of every cell in the human body.
- Consumed regularly as part of our diet
- Plays a vital role in many important areas including maintaining cell structure, fat metabolism, memory, nerve signalling, as a precursor to important neurotransmitters, and liver health

Phosphatidylcholine (PPC)

Speculated Mode of action in Injection Lipolysis

- (PPC) or (DC) or Both can cause Fat Cell wall destruction
- (PPC) Emulsifies the stored triglycerides
- (PPC) activates lipases, which break down triglycerides to fatty acids
- (PPC) possibly stimulates beta-receptors or inhibits alpha-2 receptors

Complications

- Allergic reactions
 - Swelling
 - Bruising
 - Lumps
 - Burning
 - Infection
 - Scarring
-
- Temporary nausea, vomiting & diarrhoea
 - Headache



Tattooing





Tattooing

COSMETIC / RECONSTRUCTIVE

Transmission of Hepatitis / HIV

Local Infection / Allergy

Immunogenicity



On-Shelf Cosmetics



On-Shelf Cosmetic Products

The International Fragrance Association (IFRA) lists **3,059** materials used in fragrance compounds with evidence linking many of them to health hazards

Carcinogenesis

Neurotoxicity

Liver & Kidney damage

Immune system toxicity

Respiratory Tract Irritation / Asthma

Dizziness / Drowsiness

Developmental, endocrinal & reproductive toxicity

Allergies & sensitivities

On-Shelf Cosmetic Products

- **Hydroquinone** [skin lighteners]
- **Butyl Acetate** [nail polish]
- **Butylated compounds** [lipsticks / makeup]
- **Ethanolamine compounds** [Soaps, shampoos, hair conditioners and dyes, lotions, eyeliners, mascara, eye shadows, make-up bases, foundations, sunscreens]
- **Formaldehyde & formaldehyde releasing preservatives** [nail polish / eyelash adhesive]
- **Lead Acetate** [Lipstick / Hair dyes]
- **Mercury** [preservative thimerosal in Mascaras]
- **Talc** [Eyeshadow]
- **Toluene** [nail polish / hair dyes]
- **Acrylates** [Artificial nails]
- **Benzophenone** [nail polish / foundation / sunscreens / hair spray]
- **Carbon black** [Eyeliner, mascara, nail polish, eye shadow, brush-on-brow, lipstick]
- **Coal Tar** [hair dyes]
- **Acetone** [nail polish removers]

Breast Implants



A close-up, artistic photograph of a woman's face, focusing on her eyes and a slight smile. The image is soft and slightly blurred, with a warm, golden-yellow color palette. The eyes are looking directly at the camera, and the mouth is curved upwards in a gentle smile.


Breast Implants

- No increased risk of breast cancer
- No interference with detection of cancer
- No proven link to autoimmune disease



Breast Implants

Complications

- Capsular contracture
 - Infection / Extrusion
 - Rupture
 - Malplacement
- 

Breast Implant Associated Anaplastic Large Cell Lymphoma (BIA-ALCL)

Medical Device Reports (MRD) System

- Since 1998 around 400 cases were diagnosed in millions of implants
- Textured implants
- Late non-resolving seroma
- CD30 **+ve** / Cytokeratin & Anaplastic Lymphoma Kinase (ALK) **-ve** malignant cells
- Most cases confined to capsule
- **Curable**



THANK YOU