C38 MEDICAL IMAGING IN FACIAL COSMETIC PROCEDURES

OBJECTIVES

- Define facial cosmetic procedures and minimally invasive procedures
- Explore the history of facial cosmetic procedures
- Identify the common facial injection sites and injectables
- Monitor facial cosmetic procedures with medical imaging
- Compare modalities for the best results

FACIAL COSMETIC PROCEDURES OVERVIEW

As individuals progress, the loss of facial volume becomes more prominent, causing a decrease in the strength of our musculoskeletal system, thinning of the outer layer of the skin, and a reduction of the underlying dermal layer. Cosmetic procedures focus on restoring and enhancing facial features through surgical, non-surgical, and minimally invasive methods. A minimally invasive procedure that has become increasingly popular in recent years is dermal fillers. Dermal fillers utilize a gel-like substance that is injected into the skin to help achieve volume and fullness for a more youthful rejuvenated appearance.

https://www.health.harvard.edu/staying-healthy/why-your-face-ages-and-what-you-can-do

HISTORY OF FACIAL COSMETIC PROCEDURES

In 1830, Baron Karl Ludwig von Reichenbach, a German chemist, experimented with the dry distillation of beechwood tar to find an alternative to beeswax. After conducting multiple trials and research, he learned that the beechwood tar displayed various properties including low reactivity, solid and liquid forms, and an odorless scent. Ludwig von Reichenbach named this substance paraffin.

In the years following, an Austrian surgeon, Robert Gersuny, implemented paraffin in his experiments by administering a liquid form of the substance to treat a patient with castration. After being injected into the skin, the liquid paraffin solidified and created form and structure. The effective operation further allowed him to utilize paraffin for treatments for the next 20 years.

Due to the increasing complications caused by paraffin over time, researchers began to focus on developing advanced injectables as an alternative solution.

COMMON FACIAL INJECTION SITES

- **GLABELLA:** Forehead
- **PERIOCULAR REGION:** Area Around Eyes
- **MALAR FAT PAD:** Cheekbone Area
- **PERIORAL REGION:** Area around Mouth
- **NASOLABIAL FOLDS:** Smile Lines
- **MARIONETTE LINES:** Area Around Chin
- **LIPS**

https://www.allureaestheticsltd.com/dermal-filler-treatments

COMMON INJECTABLES

Hyaluronic acid (HA)

TRADE NAME: Restylane, Juvéderm, Belotero, Revanesse, RHA, Captique, Esthélis, Elevess, Hylaform, Perlane, Prevelle, Puragen

DURATION: Up to 6 – 12 Months

PURPOSE: A natural material that temporarily treats fine and deep wrinkles, acne scars, and volumizes lips

Collagen

TRADE NAME: Zyderm, Zyplast, Alloderm, CosmoDerm, CosmoPlast, Evolence

DURATION: Up to 6 - 12 Months

PURPOSE: A natural substance that temporarily treats wrinkles and provides volume and structure to skin

COMMON INJECTABLES - CONT.

Poly-L-lactic acid (PLLA)

TRADE NAME: Sculptra Aesthetic

DURATION: More than 2 Years

PURPOSE: A synthetic substance used for volumizing facial structures, lips, and treats wrinkles for a longer duration

Polyalkylimide

TRADE NAME: Aquamid

DURATION: 2 – 5 Years

PURPOSE: A long-lasting biocompatible treatment for deep wrinkles, acne scars, patients with HIV medication side effects, and volumizes face and lips

COMMON INJECTABLES - CONT.

Calcium hydroxylapatite (CaHA)

TRADE NAME: Radiesse

DURATION: 12 Months – 5 Years

PURPOSE: A natural substance that volumizes and revives skin by treating moderate to severe wrinkles for a longer period

Polymethyl-methacrylate microspheres (PMMA)

TRADE NAME: Bellafill

DURATION: More than 5 Years

PURPOSE: A permanent solution for treating medium to deep wrinkles, acne scars, and volumizes lips

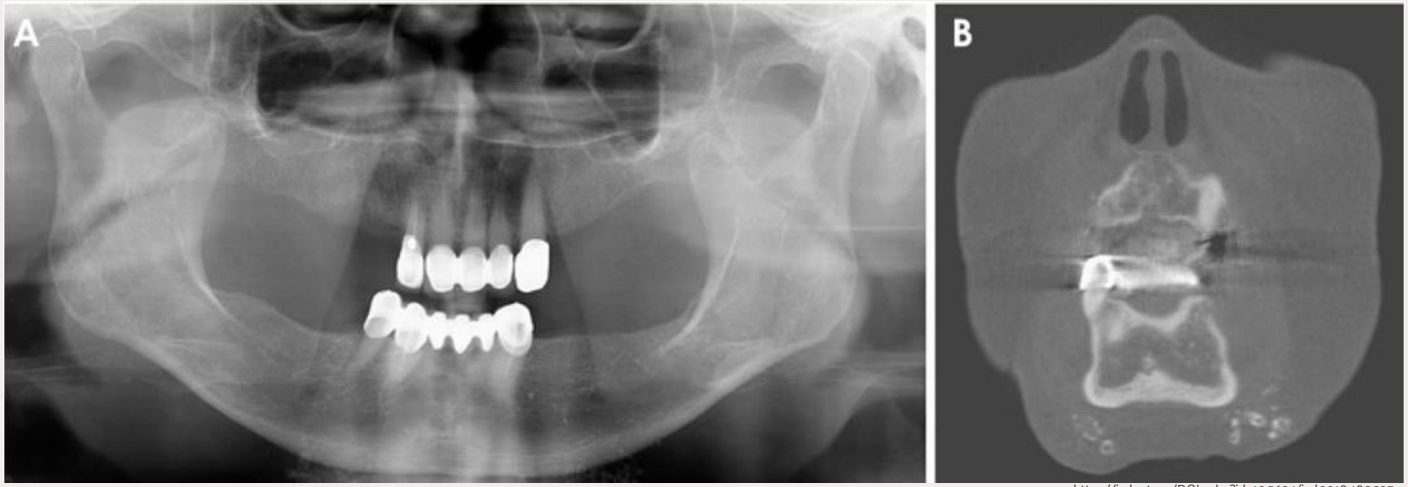
THE USE OF MEDICAL IMAGING

The effectiveness of injectable fillers may differ significantly from one individual to another.

Improper injection techniques, the longevity of dermal fillers, and the inability of proper metabolic reactions can cause adverse effects and undesired results.

The incorporation of radiologic imaging in facial cosmetic procedures can be a crucial component. It can help identify the precise placement of fillers, observe the areas of migration, and detect abnormalities to rule out conditions that may present similar imaging appearances.

MONITORING CHANGES – FILLER PLACEMENT

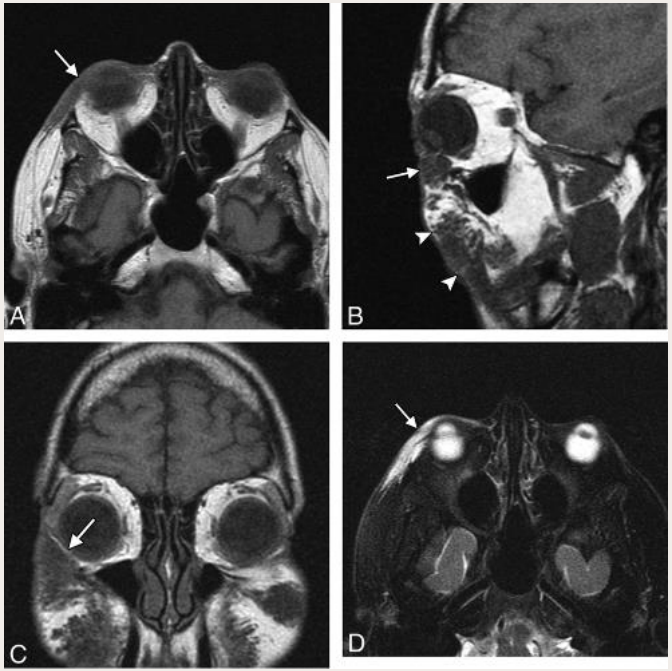


https://isdent.org/DOIx.php?id=10.5624/isd.2018.48.3.227

Delicate radiopacities can be visualized in the soft tissue area around chin due to dermal fillers 40 years prior.

IMAGES – (A) Panoramic Radiograph **(B)** Coronal CT Scan of Calcifications

MONITORING CHANGES CONT. - FILLER MIGRATION

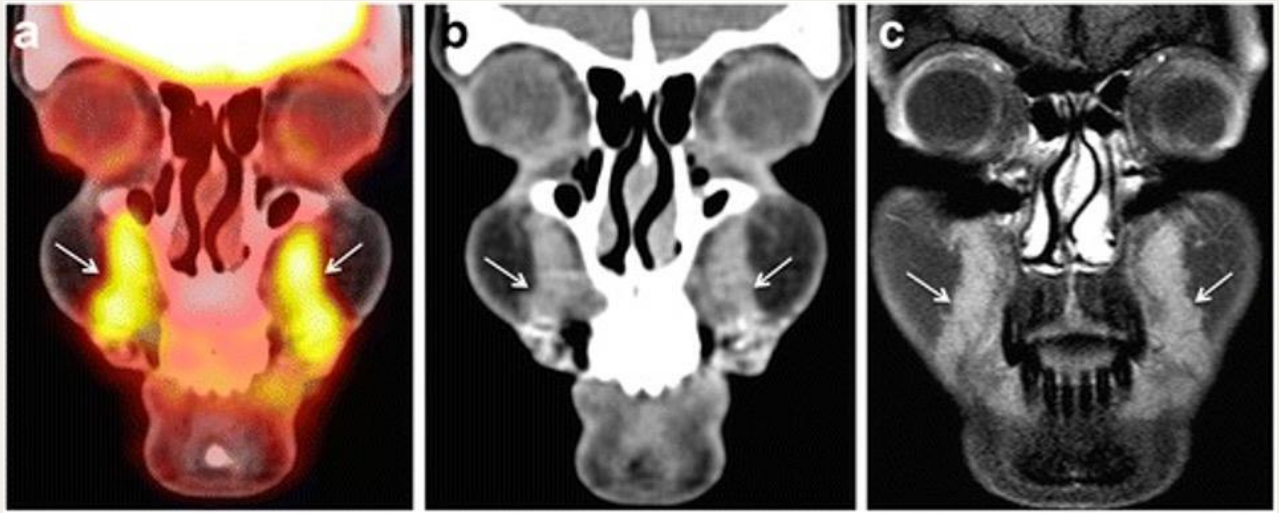


https://www.ajnr.org/content/34/8/1488

Migration can be seen on lower orbital region from former filler injection in cheeks, causing a protrusion of skin lesion.

MRI IMAGES - **(A)** Axial **(B)** Sagittal **(C)** Coronal **(D)** Axial Fat-Suppressed

MONITORING CHANGES CONT. - FILLER WITH SIMILAR IMAGING APPEARANCE AS PATHOLOGY



https://link.springer.com/article/10.1007/s13244-017-0575-0

Dermal fillers injected 4 years prior in nasolabial regions can impersonate chronic pathology conditions.

IMAGES - (A) PET-CT **(B)** CT **(C)** MRI Fat Saturated

COMPARING MODALITIES FOR BEST RESULTS

MRI

ADVANTAGES:

- Can precisely locate dermal fillers within soft tissues
- Determine the exact filler size
- Detect abnormality
- No ionizing radiation

DISADVANTAGES:

- Expensive
- Longer scanning time

Ultrasound

ADVANTAGES:

- Can locate dermal fillers in general fascia areas
- Aid in accurate filler injection
- Identify irregularities in the skin
- No ionizing radiation

DISADVANTAGES:

- Lacks reproducibility
- Lack of dermal case studies to fully ensure accurate identification

COMPARING MODALITIES FOR BEST RESULTS - CONT.

CT

ADVANTAGES:

- Can reveal calcifications in the general area of interest
- Can be used alongside MRI for detecting infections

DISADVANTAGES:

- Cannot assess soft tissue accurately
- Contrast enhanced CT preferred over normal CT
- Requires ionizing radiation

X-ray

ADVANTAGES:

- Radiopaque figures can form around general area of interest

DISADVANTAGES:

- Not easily visualized
- Cannot assess soft tissue accurately
- Requires ionizing radiation

CONCLUSION

Minimally invasive procedures are gel-like substances that are injected into the skin to replenish facial volume loss and reconstruct blemishes. The use of radiologic imaging in facial cosmetic procedures can aid in evaluating and assessing the potential complications that may arise from such procedures.

MRI, Ultrasound, CT, and X-ray are all available solutions to image dermal fillers. However, Magnetic Resonance Imaging provides the clearest visualization of soft tissues by precisely locating fillers, determining the exact size, and detecting abnormalities without the use of radiation.

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