Use of injectable dermal fillers in atrophic acne scarring

This paper focuses on whether dermal fillers are a useful treatment in atrophic acne scarring.

Acne vulgaris is a chronic skin disease characterized by the occurrence of skin lesion such as open and closed comedones, pustules, papules, and cysts (Leccia M., Auffret N., Poli F., Claudel J.-P., Corvec S., Dreno B 2015).

More than 80% of adolescents, 50–60% of women aged 20–25 years, and 12% of women over 25 suffer from acne. Factors that cause the disease include abnormal keratinization of the pilosebaceous canal, increased sebum production, bacterial colonization, inflammatory and hormonal disorders of the skin(Contassot E., French L.E. 2014)

Acne scarring is a relatively common outcome of acute acne with an estimate of 80% of acne scars being atrophic , with ice pick scars 60%, box car scars 25% ,rolled scars 15% (Jacob CI, Dover JS, Kaminer MS.2001) . Acne is characterised by follicular hyperkeratinisation and sebum over production mediated by androgens in the pilosebaceous unit. The bacterium P Acnes proliferates in this situation potentially triggering an inflammatory response which can lead to scarring. There is a higher risk of scarring with a prolonged inflammatory response and unbalanced ratio of matrix metalloproteinases (MMPs) to tissue inhibitors of MMPs (TIMPs) during the extracellular matrix remodeling (ECM) process (Fabbrocini G, Annunziata MC, D'Arco V, et al. 2010.).

Acne scarring is challenging to treat therefore prevention of scars by early aggressive treatment to reduce inflammation is key and sadly often ignored by patients and physicians. There is evidence that the use of retinoids is helpful in reducing the inflammation. Oral retinoids are more effective than antibiotics in the prevention of acne scarring (Agrawal DA, Khunger N. 2020) and topical retinoids may also play a role in prevention. (Tan J, Tanghetti E, Baldwin H, Stein Gold L, Lain E. 2019).

Types of Acne Scars

Icepick scars are deep, narrow, and can reach the border of the dermis with the subcutaneous tissue. They have sharp edges, a width of not more than 2 mm, and a V-shaped cross-section with a narrowing deep into the skin. Boxcar scars are oval or round but quite wide and flat and resemble the letter U or a square. Their edges are well marked and have a demarcated edge. They are usually 0.1–0.5 mm deep and 1.5–4 mm wide. They can combine to form clusters. Boxcar scars have the cross-section of the letter M Rolling scars are the largest of all types and can reach a diameter of 5 mm (Connolly, D.; Vu, H.L.; Mariwalla, K.; Saedi, N. 2017).

Treatment of acne scars

The treatment of acne scars is dependent on the type of scar and the extent and severity together with the downtime and preferences of patients and clinicians . There is no consensus of the best treatment regime, but the most clinicians agree that treatment results are best with a combination of therapies of a longer period. Lasers both ablative and non-ablative , RF and standard microneedling, TCA cross , peels , subcision , punch excision and PRP all have evidence of success in treating scars. This article focusses on the use of injectable substances for the improvement of acne scars.

Injectable substances can divided into Hyaluronic acids and collagen stimulators such as poly lactic acid (PLLA), Calcium Hydroxyapatite (CaH) and polymethyl methacrylate (PMMA) .

The use of injectables in acne scarring is worth considering. Firstly these treatments are readily

available and easy to administer. Second, they appear to have a good side effect profile.

Hyaluronic Acid (HA) dermal fillers

It is quite difficult to conclude what type of HA filler is most suitable and the best technique due the terminology and design of various studies. Mehrabi, Joseph et al (2023) compared a traditional crosslinked HA filler with a low molecular weight non cross-linked HA and found differences in initial results but good longer term results for both in treating acne scars but they did not state what type of scar they treated.

Another study using a cross-linked HA injecting in the dermis until it raised a bleb which was massaged flat showed a good improvement in rolling acne scars. Whilst another study using modified tower technique and high lift HA achieved high patient satisfaction. Goodman, G. J., & Van Den Broek, A. (2016). A review (Abdel Hay R, Shalaby K, Zaher H, et al. 2016) noted no difference in adverse events following dermal filler injection for acne scars compared with placebo.

The goal of treatment is to lift the scar and improve skin quality both generally and within the scars.

In conclusion, the best types of scar for dermal filler treatment are rolled scars and then boxcar scars. Volumising dermal fillers with greater cross linking are more likely to provide volume but are better injected in the deep dermis or deeper as superficial injection may create a lump which is more difficult to flatten, a modified tower technique may be useful. Less crosslinked fillers can be injected superficially but provide less lift. The problem with HA fillers is they are not long lasting and create less collagen (MercerSE et al 2010) than other products such as polylactic acid and calcium hydroxoapatite requiring more frequent multiple injections over time.

I conclude that HA fillers are best reserved for shallow rolled or boxcar scars.

Calcium Hydroxylapatite

Calcuim hydroxylapatite is longer lasting than HA filler and studies have shown good results in acne scars (Goldberg DJ, Amin S, Hussain M 2006) . Another study using diluted CaH in cross hatched lines with micro focussed HIFU showed good results with no adverse issues (Casabona 2018). Another found CaH just as good as monotherapy Antonino, A. and Francesco, A. (2020).

Other studies Treacy P (2008) found a combination of subcision and CaH helpful in rolled and boxcar scars but not icepick scars.

Polylactic Acid

PLLA has been shown to have clinical benefits up to two years (Hanke CW, Redbord KP 2007) . Beer (2007). Found that shallow broad scars responded well to PLLA but required 7 sessions . Sapra S, Stewart JA, Mraud K, Schupp R. (2015) showed excellent results (44% excellent patient satisfaction) from 3 sessions of PLLA in rolled acne scars with only one nodule formed.

PLLA is safe if injected in the deep dermis or deeper and is effective in long term improvement of rolled and shallower boxcar scars. It is not effective in ice pick scars. It is superior to HA due to its longevity.

Polymethylacrylate gel (PMMA)

Joseph et al (2019) found improved results 90% after 7 months with Polymethyl acrylate gel (PMMA) for full face acne treatment with minimal side-effects. Solomon P, et al (2021) found it to be a safe product over multiple applications. Another study (US Food and Drug Administration. FDA; 2014.) found good efficacy and safety in the treatment of acne scars.

New combination fillers

Hyaluronic acid/ calcium hydroxyapatite and hyaluronic acid/PLLA gels have recently become available and these theoretically could be useful in treating acne scarring.

Conclusion

Atrophic acne scarring is challenging to treat and requires a combination of treatments to obtain the best results. Given the current research rolling scars respond best to injectable treatments followed by shallow boxcar scars. It would appear that longer acting fillers such as calcium hydroxyapatite , poly- D-lactic acid and polymethyl acrylate are best suited to treating these scars. Injection methods vary but need to be at least deep dermal and can be global or more localised. With correct techniques these products appear to have minimal side effects and reasonable efficacy. However current research is as yet inadequate to determine best practice.

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Joseph, John H. MD[*]; Shamban, Ava MD[†]; Eaton, Laura RN, BSN[‡]; Lehman, Alayne RN, BSN, MS[§]; Cohen, Steven MD[‖,¶]; Spencer, James MD, MS[**]; Bruce, Suzanne MD[††]; Grimes, Pearl MD[‡‡]; Tedaldi, Ruth MD[§§]; Callender, Valerie MD[‖‖]; Werschler, Phillip MD[¶¶]. Polymethylmethacrylate Collagen Gel–Injectable Dermal Filler for Full Face Atrophic Acne Scar Correction. Dermatologic Surgery 45(12):p 1558-1566, December 2019

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