What are the most reliable and valid methods for assessing the severity and improvement of atrophic scars in clinical and research settings?

TBIOMD 492 Kimberly Ling and Joan Bleecker, Biomedical Science

UNIVERSITY of WASHINGTON TACOMA

Abstract:

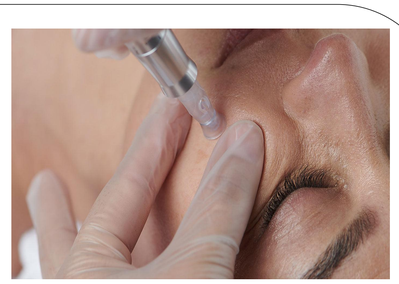
Atrophic scars are sunken areas on the skin, resulting in post-acne scars from severe acne. Treatments such as chemical peels and laser therapy help increase the skin's collagen production and smooth out scarred areas. Other methods, such as microneedling, laser therapy, and retinoids, reveal boosts in skin healing and reduce the appearance of scars. In this paper, I review research on current methods for treating scars, their effectiveness, and common side effects. I did an in-depth literature search on the University of Washington's Library Database. All research articles had to be published in peer-reviewed journals with an impact factor of 1.6 or higher. This research demonstrated the importance of personalized treatments for atrophic scars, including analyzing skin type and type of scars formed. Future directions for this study include focusing on the long-term efficacy of using combination therapy, which is significant for clinical practices and the field of dermatology. Integrated approaches were the most effective, assessing longevity based on how long treatments hold up over time, focusing on personal factors that contributed to each patient's outcome, and discovering innovative therapies to reduce side effects.

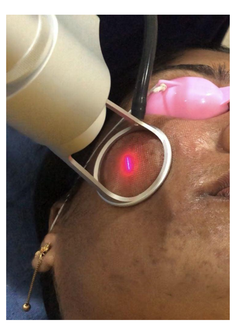
Background:

- Acne causes & types – Acne develops when hair follicles get clogged by oils and bacteria, leading to inflammation; types include blackheads, whiteheads, cystic acne, and hormonal acne.
- Contributing factors – Stress, hormonal changes, and genetics can trigger or worsen acne by increasing oil production and clogging pores.
- Atrophic scars – Occur when skin doesn't heal properly after acne damage, resulting in indentations due to low collagen production.
- Three main types of atrophic scars – Ice pick scars (narrow, deep), boxcar scars (wide, sharp edges), and rolling scars (wide, shallow, smooth edges).
- Impact on mental health – Acne and scarring can cause insecurity, leading to high stress levels and depression in some individuals.
- Treatment options – Include chemical peels, laser therapy, microneedling, topical treatments, and combinations; effectiveness varies by severity, skin type, and budget.

Methods:

Microneedling – Uses fine needles to trigger natural wound healing, stimulating collagen and elastin production; most effective for rolling and boxcar scars (Gozali & Zhou, 2015).





Ablative laser therapy – Uses short beams of light to vaporize surface skin, promoting regeneration and smoother texture; patients reported ~51% improvement, with least responsiveness in ice pick scars (Garg & Baveja, 2014; Gaber & Hession, 2015).

Methods:

- Preventive care – Gentle cleansing, avoiding picking/squeezing pimples, and dermatologist follow-up can reduce scar risk; topical treatments like retinoids and silicone gel aid healing (Fox et al., Gerber, 2016).
- Risk factors for atrophic scars – Severity and duration of acne, family history, and lesion manipulation behaviors (Tan et al., Dréno 2017).
- Retinoids – Oral isotretinoin treats severe acne and can suppress it long-term; topical tretinoin 0.05% promotes organized collagen formation, rapid skin renewal, firmer texture, reduced inflammation, and less visible scarring (Garg & Baveja, 2014).

RESULTS:

TABLE 2

Procedures to select by lesion type of scars

TREATMENT	ICE PICK SCARS	ROLLING SCARS	BOXCAR SCARS
Chemical peels			
TCA	++	-	++
CROSS technique	++	-	++
Dermabrasion/microdermabrasion	+	-	+
Laser			
Ablative and nonablative laser	-	++	++
Fractional photothermolysis	++	++	++
Punch techniques			
Punch excision	++	-	+
Punch elevation	-	-	++
Punch replacement grafting	++	-	-
Tissue augmenting agents	+	++	+
Needling	-	++	++
Subcision	+	++	+

++ = Effective, + = less effective, - = not effective

Figure 2: These two figure demonstrates different treatments for the skin and the effectiveness on three different forms of atrophic scars (Gozali et al, 2015)

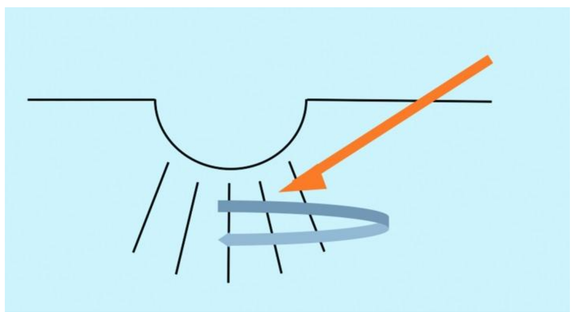


Figure 3: Demonstrating subcision works by inserting a special needle just under the skin and moving it in a fan-like pattern to loosen the scar tissue by breaking the tough fibers pulling the skin down (Hession et al Graber, 2015)

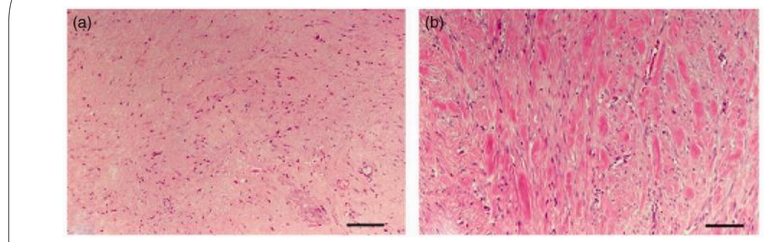


Figure 4: In atrophic scars (image a), there was only a small amount of staining, which means there's lower activity of certain growth factors. In keloid scars (image b), there was much more staining, suggesting higher growth factor activity. A standard tissue-staining method (hematoxylin and eosin) to look at the structure of both types of scars under the microscope. The scale bar :100 micrometers.(Bhat et al Garibyan,2022)

Future direction:

- This study only investigates the treatment of atrophic acne scars only.
- In future studies, focusing more on stem cell therapy and the effectiveness of stem cell therapy on other types of scars.
- Technology advancement for skin therapy
- Suggests more research on the molecular and cellular level on how atrophic scars form.
  - gene therapy such as gene editing (CRISPR) to mutate genetic information to improve the healing process of the skin
  - Study the cellular components of the skin such as epidermis cells and keratinocytes.
- Using more than one treatment together works best for reducing atrophic scars, and the choice depends on the type of scar.
- Microneedling and laser therapy can make skin smoother pretty quickly.
- New medical advances could lead to better treatments and help prevent dark spots after acne.
- In the future, scientists might even be able to change DNA to help scars heal in a more natural way
- We still don't know which mix of treatments works best for each person.
- More research is needed to find safe, long-lasting, and creative ways to treat scars.

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References:

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