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Treatment modalities of atrophic acne scars

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Abstract
Acne scarring is a prevalent dermatological concern, often resulting from delayed or inadequate treatment of acne vulgaris. These scars can be challenging to manage, frequently leading to patient dissatisfaction due to suboptimal treatment outcomes. Approximately 90% of acne scars are atrophic, characterized by a loss of collagen, while the remaining 10% to 20% are hypertrophic or keloidal, involving excess collagen deposition. Atrophic scars manifest as depressions in the skin due to fibrous tissue contraction. A variety of therapeutic interventions are available for atrophic acne scars, including chemical peels, laser resurfacing, radiofrequency treatments, subcision, microneedling, and soft-tissue augmentation. Microneedling, in particular, offers a balance between efficacy and minimal downtime, making it a favorable option for patients seeking noticeable improvements with limited recovery periods.

Keywords: Acne scars, chemical peeling, chemical peeling, laser resurfacing

Introduction
Acne scars are a common and chronic dermatological issue that impact a sizable percentage of people all over the world. They are a typical consequence of acne and their effects may be felt even after the original breakout has subsided. Acne scars are of paramount concern to both patients and dermatologists because to the substantial physical and psychological effects they may have on people [1].
Acne scars are significant not just because they are common, but also because they may have long-lasting effects on a person's physical and mental health. Acne scars are unsightly and may cause discomfort because of the changes they bring to the skin's texture, colour, and overall appearance. These outward manifestations of a past skin illness have been shown to negatively affect a person's sense of well-being, confidence, and body image. Fortunately, there have been several recent advances in therapeutic options to treat acne scarring [2].

Acne scar
Acne, a prevalent skin disease, affects the United States and numerous individuals worldwide. Over 90% of teenagers have acne, and 12% to 14% of those cases continue into adulthood, having severe psychological and social repercussions. Pilosebaceous glands are found in large numbers throughout the body, especially in the face, back, and chest. The severity of permanent scars resulting from inflammatory acne lesions may vary depending on how long patients wait to receive treatment [3]. Researchers discovered approximately 1% of the patients developed acne scars [4]

Acne Scar types
1) Atrophic Scars
- **Ice pick:** Ice pick scars are characterized by their deep yet narrow appearance, resembling puncture marks as if made by an ice pick, with a diameter of less than 2 mm. Compared to other forms of scars like rolling or boxcar scars, these scars are challenging to heal because they pierce deeply into the dermis [1].
- **Rolling scars:** Rolling scars, typically measuring 4 mm or more in diameter, are characterized by soft, irregular walls that impart a rolling appearance to the skin. Patients show 73% excellent results, and 20% good improvement. Temporary

hypopigmentation, brief burning or tingling sensations, and erythema or oedema following therapy with TCA peel. As an alternative, other substances like 88% phenol have demonstrated CROSS method efficacy comparable to TCA [5].

- **Boxcar scars:** Boxcar scars have a distinct U-shaped look and well-defined borders. They are distinguished by their broader diameter, which ranges from 1 to 4 mm. In contrast to the more rounded shapes of rolling scars, boxcar scars have distinct vertical edges that can reach 0.1 to 0.5 mm into the dermis. Boxcar scars are a particular kind of acne scar, but practitioners usually treats them in conjunction with other scar therapies, not alone [6, 7].

2) Hypertrophic and Keloidal Scars

Hypertrophic scars are caused by an over-abundance of scar tissue that protrudes above the skin's surface and is frequently the outcome of an overreaction to wound healing. Numerous treatment options for hypertrophic scars focus on various facets of scar development and appearance [8, 9].

Different therapeutic modalities for atrophic acne scars

Chemical peels

For many people, acne scars are a major cosmetic problem that negatively affects their self-esteem and general quality of life. Chemical peels are among the many available therapeutic methods that show promise, particularly for macular scarring. However, it is essential to understand that chemical peeling might not be enough to heal all acne scars, including rolling and ice-pick scars. Instead, a series of peeling sessions and supplemental homecare treatments like alpha hydroxy acids and topical retinoids are frequently required to get the best results [10, 11].

Components of chemical peels:

a) Glycolic Acid: It has been shown that treating acne scars with successive sessions of 70% glycolic acid every two weeks has positive effects [12].

b) Jessner's Solution: This Dr Max Jessner-created mixture of lactic acid, salicylic acid, and resorcinol in 95% ethanol provides good superficial exfoliation. The beta-hydroxy acid salicylic acid eliminates intercellular lipids, while resorcinol breaks weak keratin hydrogen bonds to improve the penetration of other treatments [10, 13].

c) Pyruvic acid: This alpha-ketoacid is a good peeling agent for mild acne scars since it has keratolytic, antibacterial, and sebostatic qualities. During treatment, desquamation, crusting, and severe stinging or burning sensations are possible side effects of pyruvic acid peels [14].

d) Salicylic Acid: It is known for its effectiveness in treating acne, salicylic acid is also helpful in chemical peels used to cure acne scars. Salicylic acid is a beta-hydroxy acid that facilitates the exfoliation of the epidermis by removing intercellular lipids. With very minor adverse effects, including erythema and dryness, acne scars have been successfully treated with multiple sessions of 30% salicylic acid every three to four weeks [10, 15].

e) Trichloroacetic Acid (TCA): These peels are appropriate for patients with moderate skin flaws or those looking for subtle skin tone and texture improvements because they are often gentle and well-tolerated. Gentle acids, such as beta hydroxy acids (BHAs) like salicylic acid or alpha hydroxy acids (AHAs) like glycolic acid, are commonly used in superficial peels [10, 12].

- **Needling:** Needling causes microbruises in the dermis, setting off a chain reaction of growth factors that produce collagen. A histological investigation showed increased new collagen and elastin fibre production and skin thickening. The complete impact may not become noticeable for up to three months, even though noticeable changes may start to show after roughly six weeks. Over a year, improvements in skin texture continue as collagen deposition happens gradually [16, 17] Although patient outcomes can differ, improvements are usually seen in every instance. Multiple treatments may be necessary depending on each patient's unique collagen reaction, tissue health, and desired results. Most patients receive three treatments spaced about four weeks apart. All skin types and colours can benefit from skin needling, which has a lower risk of post-inflammatory hyperpigmentation than other procedures, including laser resurfacing, chemical peels, and dermabrasion [12].

  However, people taking anticoagulant medications, those with active skin infections, and those injectable fillers within the last six months should not get skin needling. Furthermore, skin needling procedures should be avoided for those who have a personal or family history of hypertrophic and keloidal scars [18, 19].
- **Laser Resurfacing:** Laser treatment has proven to be an highly effective approach for addressing various types of acne scars, including rolling and box-car scars, whether they are deep or superficial in nature. Different types of lasers, each with its own distinct mechanism of action and efficacy profile, are employed to target acne scars. Among these, both ablative and nonablative lasers play a key role in improving skin texture and remodeling scar tissue, offering significant therapeutic benefits for individuals affected by acne scars [20].

Ablative laser, address acne scars by melting, evaporating, or vaporizing the damaged tissue. The most widely used ablative lasers for this purpose are the carbon dioxide (CO_2) laser and the Erbium YAG laser. These lasers help tighten the collagen fibers beneath the skin's surface and stimulate the production of new collagen. The depth of treatment with an ablative laser is influenced by factors such as the energy level emitted and the size of the laser spot used. CO_2 lasers are generally less selective in their action but are effective in promoting healing and the production of matrix proteins like hyaluronic acid. On the other hand, Erbium lasers are primarily focused on ablating the scar tissue, providing a more targeted approach for scar removal [12].

Clinical research has shown that CO_2 laser resurfacing effectively treats face atrophic acne scars, with notable improvements in many instances. Ablative lasers a greater risk of adverse events and consequences, including transient problems like infections and erythema, hyperpigmentation, and scarring. To reduce these hazards, careful patient selection is essential. The factors to be considered including the length of time since the previous acne breakout, stopping oral isotretinoin, negative history of both herpes virus infections, and keloids or hypertrophic scarring. After

treatment, patients with skin types that are more phototype-matched are more likely to experience hyperpigmentation [21].

Conversely, nonablative lasers do not eliminate tissue; instead, they tighten the skin and promote the production of new collagen, which brings the scar to the surface. NdYAG and diode lasers are two types of nonablative lasers that are frequently employed. Some patients prefer these lasers over ablative ones because they are linked to fewer problems and adverse effects. On the other hand, ablative laser resurfacing may yield more remarkable outcomes than nonablative laser resurfacing [22].

A more recent kind of laser therapy called fractional photothermolysis involves minor thermal wounds to cause controlled thermal damage at particular skin depths. This approach has demonstrated potential in treating acne scars and is distinct from conventional chemical peeling and laser resurfacing procedures. Compared to typical lasers, both ablative and nonablative, fractional lasers produce patterns of minor wounds encircled by unharmed tissues, yielding more modest outcomes but fewer side effects and faster recovery times [12].

Ablative fractional resurfacing (AFR) fractional lasers combine the safety and shorter downtime of fractional photothermolysis with the effectiveness of ablative methods. AFR therapies provide a safe and efficient means of treating post acne scarring by establishing a pixilated pattern of microscopic ablative lesions encircled by healthy tissue. AFR's adverse effect profile is better than that of traditional ablative CO2 devices, and the downtime is decreased due to the fast reepithelization from surrounding intact tissue [23].

Healthcare professionals must carefully assess each patient's needs and concerns and adjust their treatment plan, even with the advances in laser technology and the efficiency of laser treatment in treating acne scars. Furthermore, to guarantee the best possible results and patient satisfaction, it is essential to properly educate patients about the possible risks and advantages of laser treatment [24].

- **Ablative fractional carbon dioxide laser combined with autologous platelet-rich plasma:** Ablative fractional carbon dioxide (FCO_2) laser therapy has long been recognized as the gold standard treatment modality for individuals suffering from moderate to severe atrophic acne scars, owing to its well-documented efficacy in promoting dermal remodeling and scar reduction [25].

  Despite its significant clinical benefits, the widespread adoption of this therapeutic approach remains limited due to several notable concerns. These include the potential for adverse effects such as post-inflammatory hyperpigmentation, prolonged downtime, pain during and after the procedure, and the risk of infection. As a result, there is growing interest in identifying adjunctive treatments that may enhance therapeutic outcomes while minimizing associated risks. One such promising adjunct is platelet-rich plasma (PRP), a biologically active substance derived from autologous blood through centrifugation. This plasma component is characterized by a high concentration of platelets and an abundance of growth factors, including platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), and vascular endothelial growth factor (VEGF). These bioactive molecules play a crucial role in modulating the wound healing cascade by stimulating fibroblast activity, collagen synthesis, tissue regeneration, and neovascularization [26].

  In recent years, two systematic reviews have attempted to assess the efficacy of combining PRP with ablative FCO_2 laser therapy in the treatment of acne scars. While these reviews provided preliminary support for the synergistic effects of this combined approach, their conclusions were constrained by methodological limitations. Specifically, the included studies exhibited relatively small sample sizes, as well as substantial statistical heterogeneity arising from variations in study design, PRP preparation techniques, and laser treatment parameters [27].

- **Comparison of Fractional Micro-Plasma Radiofrequency and Fractional Microneedle Radiofrequency:** Two innovative localized energy-based devices—fractional micro-plasma radiofrequency (RF) and fractional microneedle RF—have recently received approval for their use in the management of acne scars. Both modalities have been shown in clinical studies to be effective and well-tolerated, offering promising therapeutic outcomes for individuals with atrophic acne scarring. Fractional micro-plasma RF utilizes radiofrequency energy in combination with a flow of nitrogen gas to generate controlled micro-plasma sparks. These sparks induce superficial thermal micro-ablation within the epidermis and upper dermal layers, thereby promoting tissue regeneration and the remodeling of dermal fibroblasts through localized thermal injury [28].

  On the other hand, fractional microneedle RF represents a minimally invasive intervention in which RF energy is delivered directly into the skin via an array of microneedles. This approach targets both the epidermal and dermal layers, creating discrete zones of thermal injury confined within the dermis. The resulting microthermal zones stimulate long-term dermal remodeling through the processes of neocollagenesis (the formation of new collagen) and neoelastogenesis (the formation of new elastin fibers), ultimately contributing to an improved skin texture and scar appearance [28].

  Although a growing body of literature supports the clinical efficacy of both fractional micro-plasma RF and fractional microneedle RF in improving atrophic acne scars, there remains a notable gap in comparative evidence. Specifically, no direct head-to-head studies have been conducted to evaluate the relative safety profiles and therapeutic effectiveness of these two distinct modalities. Consequently, the objective of the present investigation was to conduct a randomized, split-face clinical trial to systematically compare the outcomes of fractional micro-plasma RF and fractional microneedle RF treatments in patients presenting with atrophic acne scars [28].

- **Punch Techniques:** Atrophic scarring is the most prevalent form of post-acne scarring, typically resulting from the degradation of collagen and subcutaneous tissue during the healing process. Treatment modalities for these scars have become increasingly refined, with punch replacement techniques—such as punch excision and elevation—offering precise scar removal and improved cosmetic outcomes. These procedures are often complemented by autologous (e.g., fat grafting or

platelet-rich plasma) or non-autologous (e.g., dermal fillers) tissue augmentation to restore volume loss and enhance skin texture. The laser punch-out method, which integrates punch excision with laser resurfacing, can be applied using either the shoulder technique or an even-depth resurfacing approach, depending on scar morphology. However, for deeper atrophic scars, the laser punch-out technique has demonstrated superior effectiveness compared to even-depth resurfacing alone (Faghihi *et al*., 2015). Furthermore, combining laser skin resurfacing with punch excision has been shown to produce significant clinical improvements in facial acne scars by merging targeted physical removal of individual scars with laser-induced dermal remodeling [29, 30].

- **Dermal Grafting:** Various surgical techniques are available for the management of acne scars, including dermabrasion, simple scar excision, punch elevation, and punch grafting. Among these, facelifting, excisional procedures, and dermal punch grafting are considered both effective and widely accessible options. The choice of technique is typically guided by the classification of the scar type as well as the individual preferences of the patient. Full-thickness or split-thickness skin grafts can be successfully applied to a prepared dermal or scar tissue bed following the removal of the epidermis. This approach has proven effective not only in treating scars caused by radiation or chronic leg ulcers but also in addressing aesthetic concerns such as tattoos, pigmented giant nevi, and acne-related scarring. Dermal graft materials used in this context are generally well-tolerated, easy to handle, and offer a reliable and efficient solution for scar camouflage and tissue restoration [31, 32].
- **Tissue Augmenting Agents;** Fat is easily accessible and generally associated with minimal adverse effects, making it a favorable option for scar treatment. The procedure involves two main stages: graft procurement and graft placement. During the injection phase, small bundles of fat are carefully deposited into multiple tunnels, allowing the graft to establish maximum contact with the surrounding blood supply. Provided that no significant scar attachments remain, the contour of the treated area typically returns to its normal state after the fat injection [33].

  The use of soft tissue fillers for acne scarring presents an appealing alternative for many practitioners due to their minimally invasive nature, making them suitable for use in combination with other treatments such as microneedling or laser resurfacing [34].
- **Calcium hydroxyapatite:** Currently, calcium hydroxylapatite (CaHA) is FDA-approved for soft-tissue augmentation, particularly around the nose and mouth, as well as for use in craniofacial surgeries. CaHA gained significant attention during the time when dermal fillers were used to address facial lipoatrophy induced by antiretroviral therapy. While generally well-tolerated, it is important to note that CaHA has been associated with the formation of persistent nodules in a small percentage of individuals, particularly when injected into the vermillion border of the lips [35].
- **Plasma gel in atrophic acne scars:** Plasma gel has shown significant improvements in the appearance of acne scars after just a single session, providing a fast and effective treatment option for many patients. When combined with derma-roller therapy, the application of plasma gel further enhanced the treatment results, resulting in more noticeable improvements in scar texture and overall appearance[36]. A study conducted to compare the effectiveness of platelet-rich plasma (PRP) in its "fluid" and "gel" forms, when paired with fractional CO2 laser therapy, included 27 patients who were experiencing atrophic acne scars. In this study, the fractional CO2 laser treatment was applied in combination with either plasma fluid or gel, with each being randomly assigned to the right or left side of the participants' faces. Clinical evaluations, along with Optical Coherence Tomography (OCT) scans, were performed at baseline, one month, and three months after the final treatment session to assess the outcomes of these combined therapies [37].

Conflict of Interest
Not available

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References

1. Agrawal DA, Khunger N. A morphological study of acne scarring and its relationship between severity and treatment of active acne. Journal of Cutaneous and Aesthetic Surgery. 2020;13:210-216.
2. Zhou C, Vempati A, Tam C, Khong J, Vasilev R, Tam K, *et al*. Beyond the surface: a deeper look at the psychosocial impacts of acne scarring. Clinical, Cosmetic and Investigational Dermatology. 2023:731-738.
3. Mohsin N, Hernandez LE, Martin MR, Does AV, Nouri K. Acne treatment review and future perspectives. Dermatologic Therapy. 2022;35:30-15.
4. Mohsin N, Hernandez LE, Martin MR, Does AV, Nouri K. Acne treatment review and future perspectives. Dermatologic Therapy. 2022;35:e15719.
5. Callaghan DJ. Review on the treatment of scars. Plastic and Aesthetic Research. 2020;7:30-15.
6. Alam M, Han S, Pongprutthipan M, Disphanurat W, Kakar R, Nodzenski M, *et al*. Efficacy of a needling device for the treatment of acne scars: a randomized clinical trial. JAMA Dermatology. 2014;150:844-849.
7. Cachafeiro T, Escobar G, Maldonado G, Cestari T, Corleta O. Comparison of nonablative fractional erbium laser 1,340 nm and microneedling for the treatment of atrophic acne scars: a randomized clinical trial. Dermatologic Surgery. 2016;42:232-241.
8. Bulstrode NW, Mudera V, McGrouther DA, Grobbelaar AO, Cambrey AD. 5-fluorouracil selectively inhibits collagen synthesis. Plastic and Reconstructive Surgery. 2005;116:209-221.
9. Morelli Coppola M, Salzillo R, Segreto F, Persichetti P. Triamcinolone acetonide intralesional injection for the treatment of keloid scars: patient selection and perspectives. Clinical, Cosmetic and Investigational Dermatology. 2018:387-396.
10. Moghimipour E. Hydroxy acids, the most widely used anti-aging agents. Brieflands. 2012:9-10.
11. Sharad J. Glycolic acid peel therapy-a current review. Clinical, Cosmetic and Investigational Dermatology.

2013:281-288.
12. Sethupathi SK, Poole M, Darji K, Fehlman J. Cosmetic dermatology concerns in older adults. Clinical Medicine Geriatrics. 2024;40:197-210.
13. Dayan E, Rohrich RJ. Jessner's solution with trichloroacetic acid chemical peel: optimizing outcomes and safety. Plastic and Reconstructive Surgery Global Open. 2019 May 17;7(5):e2250.
14. Khunger N, Chanana C. Chemical peels. In: Essentials for Aesthetic Dermatology in Ethnic Skin. CRC Press; 2023. p. 171-176.
15. Lu J, Cong T, Wen X, Li X, Du D, He G, *et al*. Salicylic acid treats acne vulgaris by suppressing AMPK/SREBP 1 pathway in sebocytes. Experimental Dermatology. 2019;28:786-794.
16. Alessa D, Bloom JD. Microneedling options for skin rejuvenation, including non-temperature-controlled fractional microneedle radiofrequency treatments. Facial Plastic Surgery Clinics of North America. 2020;28:1-7.
17. Sitohang IBS, Sirait SAP, Suryanegara J. Microneedling in the treatment of atrophic scars: a systematic review of randomised controlled trials. International Wound Journal. 2021;18:577-585.
18. Juhasz ML, Cohen JL. Microneedling for the treatment of scars: an update for clinicians. Clinical, Cosmetic and Investigational Dermatology. 2020:997-1003.
19. Atiyeh BS, Abou Ghanem O, Chahine F. Microneedling: percutaneous collagen induction (PCI) therapy for management of scars and photoaged skin—scientific evidence and review of the literature. Aesthetic Plastic Surgery. 2021;45:296-308.
20. Buslach N, Foulad DP, Saedi N, Mesinkovska NA. Treatment modalities for cherry angiomas: a systematic review. Dermatologic Surgery. 2020;46:1691-1697.
21. Mekić S, Hamer M, Wigmann C, Gunn D, Kayser M, Jacobs L, *et al*. Epidemiology and determinants of facial telangiectasia: a cross-sectional study. Journal of the European Academy of Dermatology and Venereology. 2020;34:821-826.
22. Dai YX, Chuang YY, Chen PY, Chen CC. Efficacy and safety of ablative resurfacing with a high-energy 1,064 Nd-YAG picosecond-domain laser for the treatment of facial acne scars in Asians. Lasers in Surgery and Medicine. 2020;52:389-395.
23. Nischwitz SP, Lumenta DB, Spendel S, Kamolz LP. Minimally invasive technologies for treatment of HTS and keloids: pulsed-dye laser. In: Textbook on Scar Management: State of the Art Management and Emerging Technologies. 2020. p. 263-269.
24. Fischer T, Perosino E, Poli F, Viera M, Dreno B, Group CDEE. Chemical peels in aesthetic dermatology: an update 2009. Journal of the European Academy of Dermatology and Venereology. 2010;24:281-292.
25. Arsiwala SZ, Desai SR. Fractional carbon dioxide laser: optimizing treatment outcomes for pigmented atrophic acne scars in skin of color. Journal of Cutaneous and Aesthetic Surgery. 2019;12:85-94.
26. Peng GL. Platelet-rich plasma for skin rejuvenation: facts, fiction, and pearls for practice. Facial Plastic Surgery Clinics of North America. 2019;27:405-411.
27. Hsieh TS, Chiu WK, Yang TF, Wang HJ, Chen C. A meta-analysis of the evidence for assisted therapy with platelet-rich plasma for atrophic acne scars. Aesthetic Plastic Surgery. 2019;43:1615-1623.
28. Lan T, Tang L, Xia A, Hamblin MR, Jian D, Yin R. Comparison of fractional micro-plasma radiofrequency and fractional microneedle radiofrequency for the treatment of atrophic acne scars: a pilot randomized split-face clinical study in China. Lasers in Surgery and Medicine. 2021;53:906-913.
29. Faghihi G, Nouraei S, Asilian A, Keyvan S, Abtahi-Naeini B, Rakhshanpour M, *et al*. Efficacy of punch elevation combined with fractional carbon dioxide laser resurfacing in facial atrophic acne scarring: a randomized split-face clinical study. Indian Journal of Dermatology. 2015;60:473-478.
30. Savita K, Ranagol A, Hosthota A, Pujar RV, Koregol AC. Dermaroller as an inexpensive and excellent therapeutic modality in the treatment of acne scars along with subcision and punch floatation. IP Indian Journal of Clinical and Experimental Dermatology. 2020;4:319-323.
31. Fabbrocini G, Annunziata MC, D'Arco V, De Vita V, Lodi G, Mauriello M, *et al*. Acne scars: pathogenesis, classification and treatment. Dermatology Research and Practice. 2010;2010:25-25.
32. Dashore S, Dashore A. Platelet-poor plasma-based biofiller: an innovative alternative to expensive hyaluronic acid-based fillers for treatment of chicken pox scars. Journal of the American Academy of Dermatology. 2021;84:11-13.
33. Werschler WP, Few JW, Jacob CI, Joseph JH, Spencer JM, Taub AF. Advancing the care of post-acne scarring: expert insights into new treatment options. Journal of Drugs in Dermatology. 2016;15:518-525.
34. Tam C, Khong J, Tam K, Vasilev R, Wu W, Hazany S. A comprehensive review of non-energy-based treatments for atrophic acne scarring. Clinical, Cosmetic and Investigational Dermatology. 2022:455-469.
35. Behrangi E, Goodarzi A, Roohaninasab M, Sadeghzadeh-Bazargan A, Nobari NN, Ghassemi M. A review of scar treatment related to acne and burn. Journal of Critical Reviews. 2020;7:714-722.
36. Elfar NN, Hasby EA. Efficacy and safety of plasma gel as a new modality in treatment of atrophic acne scars. International Journal of Dermatology. 2020;59:620-626.
37. Gawdat HI, El-Hadidy YA, Allam RS, Abdelkader HA. Autologous platelet-rich plasma 'fluid' versus 'gel' form in combination with fractional CO_2 laser in the treatment of atrophic acne scars: a split-face randomized clinical trial. Journal of Dermatological Treatment. 2022;33:2654-2663.

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