RESEARCH ARTICLE

The efficacy of combined Intense pulsed light plus high-intensity focussed ultrasound with two different powers in the treatment of atrophic and Icepick acne scars

Fatima Ahmed Salem[1], Mustafa Salih Ali Al Musawi[2], Wisam Majeed Kattoof[3]

Abstract

Objective: To determine the clinical efficacy and suitable power of high-intensity focussed ultrasound combined with intense pulsed light to treat acne scarring.

Methods: The prospective study was conducted at the College of Medicine, Mustansiriyah University, Baghdad, Iraq, from September 2020 to March 2021, and comprised patients of either gender with atrophic or icepick scars. They were divided into atrophic scar group A and icepick scar group B. Both groups were first treated with intense pulsed light and then with high-intensity focussed ultrasound using 30J/cm^2 and 40J/cm^2 power. There were overall 4 sessions with an interval of 4 weeks. The outcome was assessed using the Patient and Observer Scar Assessment Scale. Data was analysed using SPSS 25.

Results: Of the 22 patients with a mean age of 20.86±3.22 years, there were 11patients in group A; 7(70%) females and 4(30%) males with a mean age of 20.5±2.06 years. There were 11patients in group B; 7(70%) males and 4(30%) females with a mean age of 21.27±4.19 years. There was a significant difference between baseline and post-intervention scores for both groups ($p<0.05$), and power 30J/cm^2 was significantly better compared to 40J/cm^2 ($p<0.05$).

Conclusion: The developing technique using high-intensity focussed ultrasound and intense pulsed light was found to be effective in treating scars with 30J/cm^2 power.

Key Words: Cicatrix, Tissue diseases, Atrophy, Acne vulgaris, Icepick.

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Introduction

Skin texture may be improved using intense pulsed light (IPL) systems[1]. A filter used in this technique creates a pulsed, non-coherent, polychromatic light that may be adjusted to target specific areas of the skin[2,3]. The high-intensity focussed ultrasound (HIFU) technique relies on bringing an ultrasound beam to a tight focus at a distance from the transducer[4]. Acne is a chronic inflammatory skin disorder that affects >85% of teenagers and often persists into adulthood[5]. The scar is defined as a fibrous tissue that replaces normal tissue destroyed by injury or disease[6]. The atrophic scar has an indentation or depression in the skin below the level of the surrounding tissues. The sunken appearance of these scars is linked to collagen loss or anomalies in collagen production and injury, atrophy, or deficit of the underlying subcutaneous tissue. Its duration varies from 3 to 24 months[7]. Keloids scars are deep, depressed grooves that extend vertically to the deep dermis or subcutaneous tissue, and always expand beyond the original wound margin while continuing to increase with time [8].

Wang et al. in 2013 found that IPL treatments dramatically decreased inflammation and alleviated atrophic scarring. Nearly 90% of the patients reported considerable or moderate overall improvement, and nearly 80% evaluated their outcomes as 'great' or 'good'[9]. Combining injections of corticosteroids in the lesion with IPL is a successful and desired approach for treating keloid and hypertrophic scars, as shown by Meymandi et al. in 2014, who reported that the medication was well-tolerated by the patients, and there were very few reported adverse effects[10].

The current study was planned to explore the clinical effect and appropriate power of HIFU combined with IPL in the treatment of acne scarring.

Patients and Methods

The prospective study was conducted at the postgraduate physiology laboratory of the Department of Medical Physics, College of Medicine, Mustansiriyah University, Baghdad, Iraq from September 2020 to March 2021. After approval from the institutional ethics review committee, the sample was raised using a consecutive

Department of Physiology and Medical Physics, Mustansiriyah University, Baghdad, Iraq.

Correspondence: Mustafa Salih Ali Al Musawi

Email: Laser_mu@yahoo.com

nonprobability sampling technique. Inclusion criteria: over 18-year healthy adults from both gender with atrophic or ice pick acne scars while exclusion criteria: those who have active acne vulgaris, those receiving medications (topical and systemic) to treat acne in the last month, or those exposed to laser and other types of therapy including HIFU to remove the scars in the last three months.

After obtaining informed consent from the patients, they were divided into atrophic scar group A and icepick scar group B. Both groups were first treated with IPL (Fuqeng Medical Technology Co. Ltd., Hong Kong) immediately followed by HIFU (Product Astiland model as-hf-duo, China) with 30J/cm^2 and 40J/cm^2 power. The HIFU hand used a wavelength of 590nm. Other HIFU parameters included DL cartilage 3.0mm, length 30mm, clearance 1.5mm, width 10mm, and pitch 1.5mm.

The treatment was administered at 4-week intervals, and patients received an average of 4 sessions (as some patients ask for more sessions to assure complete clearance but these were defaulted from data analysis in this study). All patients were imaged with a camera (Canon, powerShot SX420 is 20.0MP HD 720p), picturing the healing process of each session. The outcome was assessed using the Patient and Observer Scar Assessment Scale (POSAS)[11] at each appointment and 1-3 months post-intervention. The patients scored their scars using the patient component of POSAS, blinded to the observers' results. The observer component was conducted by two dermatologists who were blinded to the research participants and treatments. It documented side effects and assessed 6 scar parameters: vascularity, pigmentation, thickness, relief, pliability and surface area[11].

Data was analysed using SPSS 25. Quantitative data was compared using students' paired t-tests, and the chi-square test was used for the level of significance. P<0.05 was considered statistically significant.

Results

Of the 22 patients with a mean age of 20.86±3.22 years, there were 11 patients in group A; 7(70%) females and

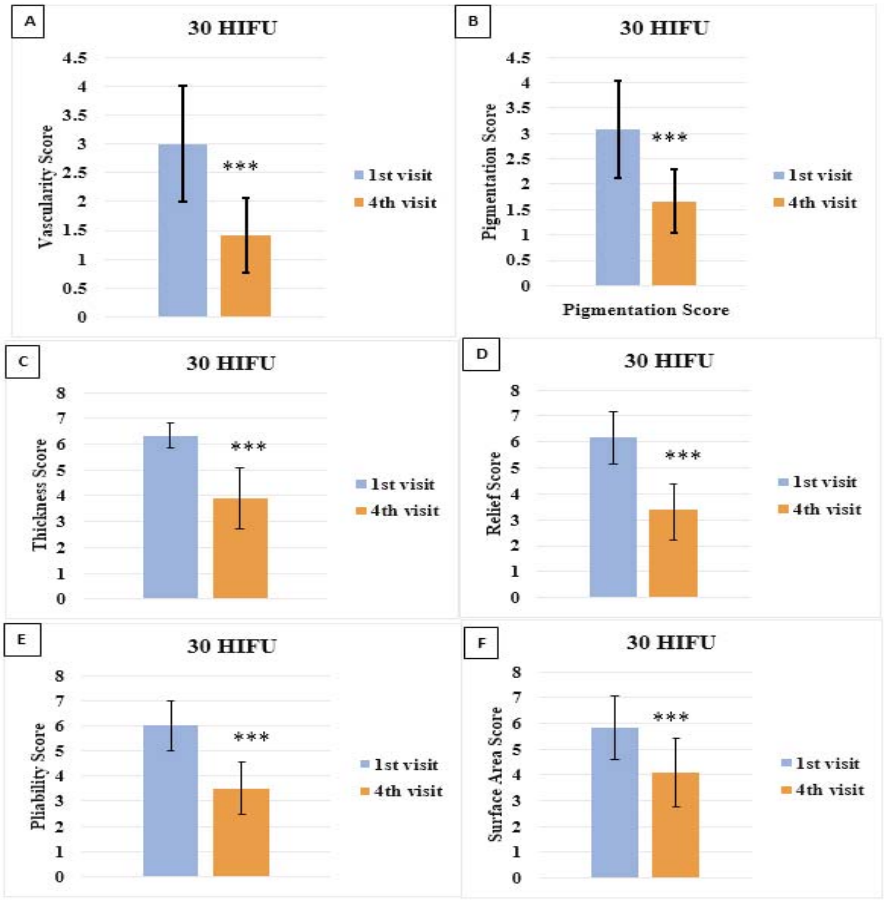

Figure-1: The score for patient treated with power of 30J/cm^2: A)Vascularity, B)Pigmentation, C)Thickness, D)Relief, E)Pliability, F)Surface Area. (***) = P<0.0001

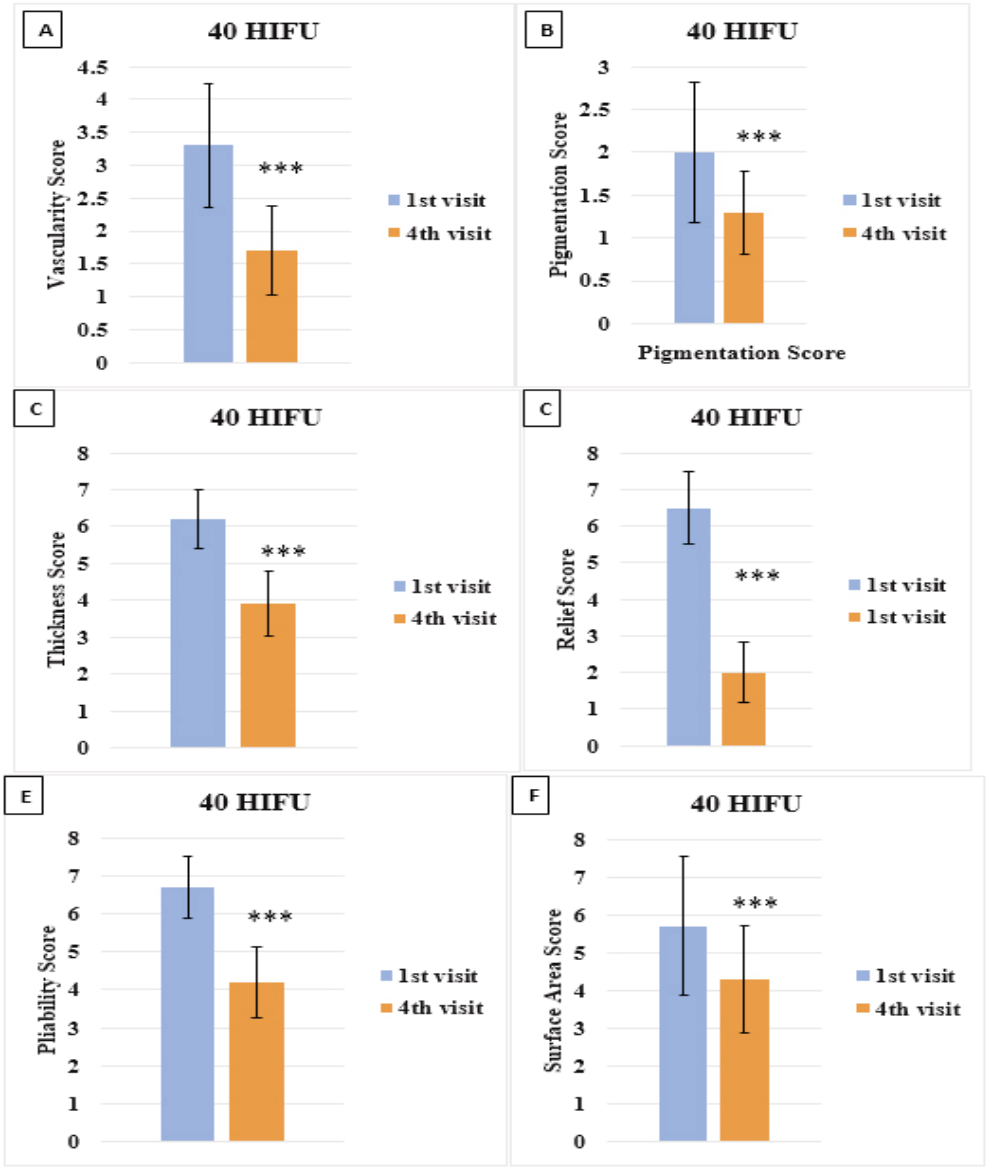

Figure-2: The score for patient treated with power of 40J/cm^2: A)Vascularity, B)Pigmentation, C)Thickness, D)Relief, E)Pliability, F)Surface Area. (***) = P<0.0001

4(30%) males with a mean age of 20.5±2.06 years. There were 11 patients in group B; 7(70%) males and 4(30%) females with a mean age of 21.27±4.19 years. The duration of the infection in group A was 39.6±26.56 weeks and 56.72±19.54 weeks in group B. There was no significant intergroup difference related to age and duration (p>0.05), while gender distribution was significantly different (p<0.0001). The treatment with HIFU power 30J/cm^2 showed significant difference between baseline and post-treatment for all 6 parameters (Figure). The effect of treatment with HIFU power 40J/cm^2 showed significant differences between baseline and post-treatment values (Figure 2). All scores related to HIFU power 30J/cm^2 were better than those with power 40J/cm^2 (p<0.05) (Figure 3).

Discussion

The IPL is widely used to treat acne scars minimally over 5 or more sessions[12]. The HIFU is used to treat skin abnormalities[13]. The current study attained better results with fewer sessions. It was low-cost and led to smoother skin. As most common types of scars are atrophic and ice pick, current study divided the patients into two groups with these scars and subjected them to IPL followed immediately by HIFU with two different powers.

Non-significant differences were seen across scar forms

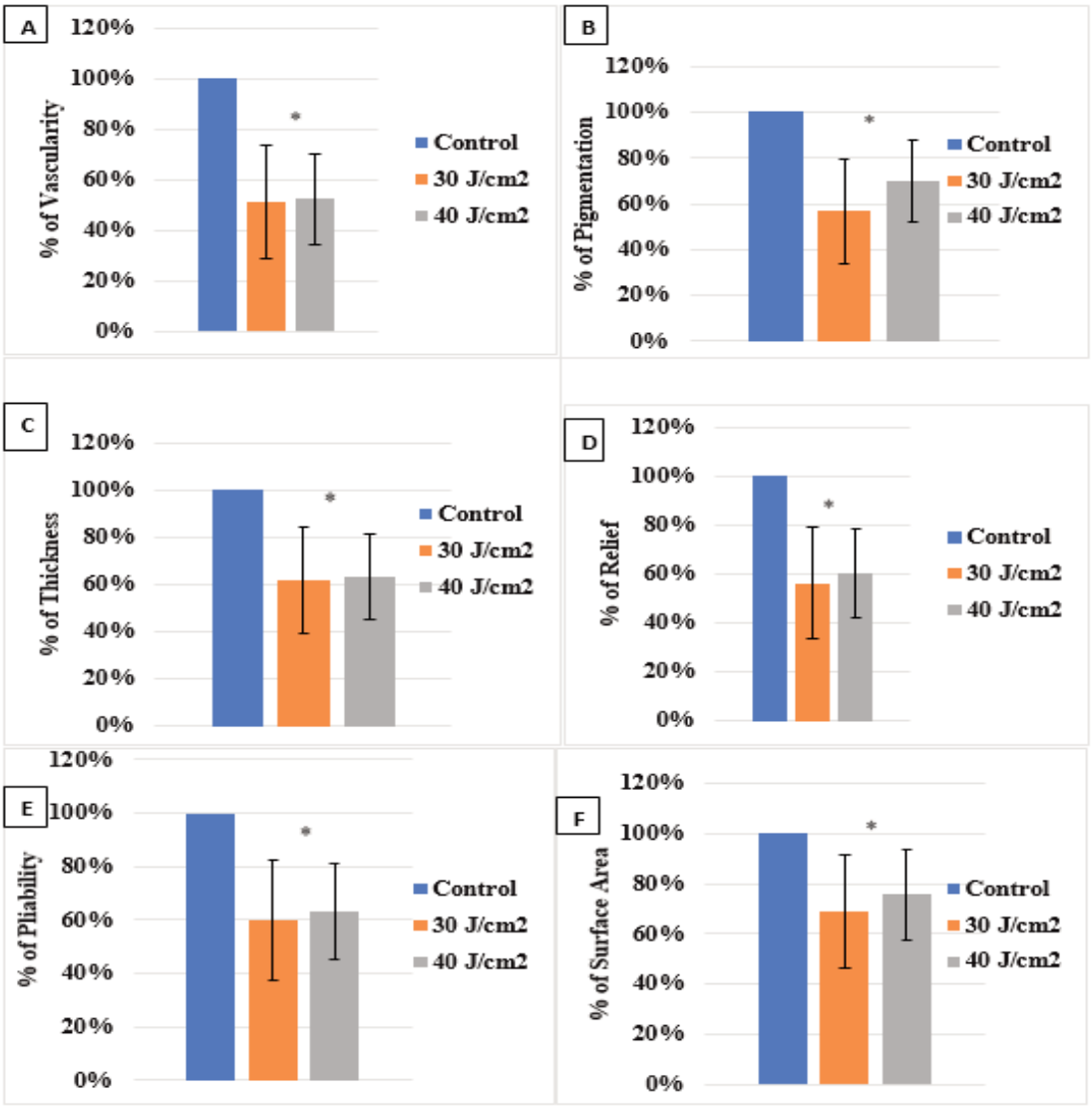

Figure-3: The percentage of relief comparison score for patient treated with power of 30J/cm^2 and 40J/cm^2: A) Vascularity, B) Pigmentation, C) Thickness, D) Relief, E) Pliability, F) Surface Area. (* = P<0.05)

based on patient age and infection duration. Acne is typically thought of as a skin condition that affects teenagers, although it may affect people regardless of age. In a recent community-based survey in the United Kingdom, 14% of adult women aged 26-44 years were found to have facial acne[14].

The current results showed that the prevalence of icepick scars in male patients was higher than atrophic scars. The opposite was true of the female patients.

According to Bagatin et al., post-adolescent acne in females may be classified as 'persistent acne', which refers to acne that persists from adolescence into adulthood, and 'late-onset acne', which refers to substantial acne that occasionally appears for the first time beyond the age of 25 years. The clinical presentation of various kinds of acne in adult females may be somewhat different from that of traditional teenage illness[15].

HIFU has many aesthetic benefits, including wrinkle reduction, tightening of sagging skin on the neck (sometimes called turkey neck), lifting of the cheeks, eyebrows and eyelids, enhancement of jawline definition, tightening of the décolletage, and smoothening of the skin[16].

Antonino et al. in 2021[17] assessed the safety and

effectiveness of calcium hydroxylapatite monotherapy and its association with high-intensity micro-focussed ultrasound (HIFMU) for treating atrophic acne scars. They found that calcium hydroxylapatite and HIMFU were safe and effective treatments for atrophic scar acne.

The POSAS assessed treatment efficiency in the current study. The patients who received the combination technique with power 30J/cm^2 gave a better effect than those with power 40J/cm^2. It depends on the scores for vascularity, pigmentation, thickness, relief, pliability and surface area[18].

To our knowledge, the current study is the first involving the use of IPL and HIFU techniques in the same treatment.

Limitation: The sample size was not calculated which could have reduced the power of the study.

Conclusion

The developing technique using HIFU and IPL was found to be effective in treating atrophic and icepick scars in a shorter time than these techniques used in isolation. The low power of 30J/cm^2 showed a better effect than the high power of 40J/cm^2.

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Conflict of Interest: None.

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References

1. Han YJ, Jeong Y, Whang KK. Treatment of hypertrophic scars and keloids using intense pulsed light. Korean J Dermatol 2009;47:395-402.
2. Daoud AA, Gianatasio C, Rudnick A, Michael M, Waibel J. Efficacy of Combined Intense Pulsed Light (IPL) With Fractional CO2-Laser Ablation in the Treatment of Large Hypertrophic Scars: A Prospective, Randomized Control Trial. Lasers Surg Med 2019;51:678-85. doi: 10.1002/lsm.23092
3. Babilas P, Schreml S, Szeimies RM, Landthaler M. Intense pulsed light (IPL): a review. Lasers Surg Med 2010;42:93-10. doi: 10.1002/lsm.20877
4. Haar GT, Coussios C. High intensity focused ultrasound: physical principles and devices. Int J Hyperthermia 2007;23:89-10. doi: 10.1080/02656730601186138
5. Li DG, Pournamdari AB, Liu KJ, Laskowski K, Joyce C, Mostaghimi A. Evaluation of Point-of-Care Decision Support for Adult Acne Treatment by Primary Care Clinicians. JAMA Dermatol 2020;156:538-44. doi: 10.1001/jamadermatol.2020.0135
6. Goodman GJ. Postacne scarring: a review of its pathophysiology and treatment. Dermatol Surg 2000;26:857-71. doi: 10.1046/j.1524-4725.2000.99232.x
7. Rabello FB, Souza CD, Farina Júnior JA. Update on hypertrophic scar treatment. Clinics (Sao Paulo) 2014;69:565-73. doi: 10.6061/clinics/2014(08)11
8. Goodarzi A, Behrangi E, Ghassemi M, Nobari NN, Sadeghzadeh-Bazargan A, Roohaninasab M. Acne scar; a review of classification and treatment. J Crit Rev 2020;7:1108-1114. doi: 10.31838/jcr.07.07.204
9. Wang B, Wu Y, Luo YJ, Xu XG, Xu TH, Chen JZ, et al. Combination of intense pulsed light and fractional CO(2) laser treatments for patients with acne with inflammatory and scarring lesions. Clin Exp Dermatol 2013;38:344-51. doi: 10.1111/ced.12010
10. Shamsi Meymandi S, Rezazadeh A, Ekhlasi A. Studying intense pulsed light method along with corticosteroid injection in treating keloid scars. Iran Red Crescent Med J 2014;16:e12464. doi: 10.5812/ircmj.12464
11. Fearmonti RM, Bond JE, Erdmann D, Levin LS, Pizzo SV, Levinson H. The modified Patient and Observer Scar Assessment Scale: a novel approach to defining pathologic and nonpathologic scarring. Plast Reconstr Surg 2011;127:242-7. doi: 10.1097/PRS.0b013e3181f959e8
12. Kearney C, Brew D. Single-session combination treatment with intense pulsed light and nonablative fractional photothermolysis: a split-face study. Dermatol Surg 2012;38:1002-9. doi: 10.1111/j.1524-4725.2012.02401.x
13. Colombel M, Gelet A. Principles and results of high-intensity focused ultrasound for localized prostate cancer. Prostate Cancer Prostatic Dis 2004;7:289-94. doi: 10.1038/sj.pcan.4500721
14. Williams C, Layton AM. Persistent acne in women : implications for the patient and for therapy. Am J Clin Dermatol 2006;7:281-90. doi: 10.2165/00128071-200607050-00002
15. Bagatin E, Freitas THP, Rivitti-Machado MC, Machado MCR, Ribeiro BM, Nunes S. et al. Adult female acne: a guide to clinical practice. An Bras Dermatol 2019;94:62-75. doi: 10.1590/abd1806-4841.20198203
16. Izadifar Z, Izadifar Z, Chapman D, Babyn P. An Introduction to High Intensity Focused Ultrasound: Systematic Review on Principles, Devices, and Clinical Applications. J Clin Med 2020;9:460. doi: 10.3390/jcm9020460
17. Antonino A, Francesco A. Prospective and randomized comparative study of calcium hydroxylapatite vs calcium hydroxylapatite plus HIFU in treatment of moderate-to-severe acne scars. J Cosmet Dermatol 2021;20:53-61. doi: 10.1111/jocd.13472
18. Abbas KF, Al Musawi MS, Kattoof WM. Fast tattoo removal using Q-Switching ND-YAG laser technique with multi pass sessions. J Pak Med Assoc 2021;71(Suppl 8):s161-5.