"A split face comparative interventional study to compare the effectiveness of microneedling radiofrequency followed by platelet rich plasma vs microneedling radiofrequency followed by injectable platelet rich fibrin in post acne scars."

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Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"A SPLIT FACE COMPARATIVE INTERVENTIONAL STUDY TO EVALUATE EFFICACY OF MICRONEEDLING RADIOFREQUENCY FOLLOWED BY PLATELET RICH PLASMA VS MICRONEEDLING RADIOFREQUENCY FOLLOWED BY AUTOLOGOUS INJECTABLE PLATELET RICH FIBRIN IN POST ACNE SCARS"** is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee.

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LISTS OF ABBREVIATIONS USED

Sl no	Abbreviations used	Expansion
1.	MNRF	Microneedling Radiofrequency
2.	PRP	Platelet Rich Plasma
3.	I-PRF	Injectable Platelet Rich plasma
4.	TCA CROSS	Trichloroacetic acid
5.	IGF-1	Insulin like growth factor-1
6.	GH1	Growth Hormone 1
7.	GHR	Growth Hormone Receptor
8.	IGFBP3	Insulin like growth factor binding protein 3
9.	IGF1R	Insulin like growth factor-1 Receptor
10.	FOXO1A	Forkhead box protein O 1 A
11.	PPAR	Peroxisome proliferator activated receptor
12.	FGF-2	Fibroblast growth factor-2
13.	MC5R	Melanocortin 5 receptor
14.	MMP	Matrix metalloproteinase
15.	TNF α	Tumor necrosis factor α
16.	IL-1 Alpha	Interleukin 1-α
17.	HRQOL	Health-related quality of life
18.	NAFL	Non Ablative Fractional Laser

19.	MTZ	Micro Thermal Zone
20.	RF	Radiofrequency
21.	PDGF	Platelet derived growth factor
22.	TGF-β	Transforming growth factor -β
23.	VEGF	Vascular endothelial growth factor
24.	EGF	Epidermal growth factor

ABSTRACT

BACKGROUND AND OBJECTIVES:

Acne scars result from changes in the skin's healing process triggered by inflammation, where atrophic scars show signs of inflammatory cell infiltration. Treatments range from surgery to less invasive methods like laser therapy. Newer technologies like MNRF and fractional CO2 laser are quicker and safer. MNRF and PRP or PRF offer a combined approach, stimulating collagen production and aiding in wound healing. The study aims to compare the effectiveness of MNRF with PRP versus PRF in treating acne scars, aiming to improve scar management strategies.

MATERIALS AND METHODS:

This is a split face, interventional study consisting of 43 participants with moderate grading of scars to severe grading of scars as per Goodman and Baron qualitative grade[1]. Participants underwent three sessions, four weeks apart, of Microneedling Radiofrequency on both sides, followed by PRP on left side and I-PRF on the right side of the face. Goodman and Baron qualitative grade [1]and quantitative grades [2] were employed in the assessment of the outcomes in addition to visual analogue scale for patient contentment and physician assessment of scars was also done. The procedure's aftereffects were also assessed and contrasted.

RESULTS:

Based on the Goodman and Baron quantitative grade, the scars on both sides of the face had significantly improved, although this difference did not reach statistical significance. Independent t-tests were employed to compare Goodman and Baron quantitative scores in both groups. P-values less than 0.05 were regarded as statistically significant. To analyse the qualitative scores, visual analogue scale (VAS), physician assessment, and adverse effects between both sides and before and after comparison, chi-squared tests were utilized.

The statistical analysis of Goodman and Baron's qualitative[1] score between right and left sides revealed that these changes did not reach significance, with p-values of 0.41 for the right side and 0.44 for the left side.

Regarding the VAS score, a larger proportion noted improvements between 50-75% after the intervention (55.8% on right side and 65.1% on left side). Statistical analysis showed highly significant differences before and after the intervention, with p-values of less than 0.001 for right side and 0.03 for the side.

In the physician assessment of scars, Grade 2 improvement was observed with 34.9% and 60.5% on the left and right sides, respectively, representing a difference from the baseline that is statistically significant ($p < 0.001$).

Adverse effects like redness, burning sense, scabbing, and oedema was observed in almost all participants, although none of these effects lasted longer than seven days. Across the two sides of the face, the adverse effects were uniform.

CONCLUSION:

Both PRP and I-PRF post MNRF were effective in the treating acne scars. In comparison, results between the two modalities did not yield statistically significant results.

I-PRF exhibited better visual differences and longer-lasting filling effects, even though the Goodman and Baron scoring system did not show statistically significant changes.

However, despite its simplicity, safety, rapidity, and cost-effectiveness, further controlled trials are necessary to investigate I-PRF's efficacy, either independently or in conjunction with different treatment methods. These trials can be essential to substantiate I-PRF's potential to be able to replace PRP in managing various skin conditions

LIMITATIONS:

The study’s limitations were its limited sample quantity, short follow-up duration, short duration of the study.

Keywords:Microneedling Radiofrequency, Platelet Rich Plasma, Injectable Platelet Rich Fibrin

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INTRODUCTION

Acne vulgaris (Acne), persistent condition involving inflammation of pilo-sebaceous unit, commonly impacting regions which have a higher concentration of sebum producing glands responsive to hormones, involving the face, neck, chest, upper part of back, and upper arms.[3]

The initial inflammatory changes in acne occurs all throughout the evolution, ranging through micro-comedones to blackheads, progressing to lesions involving inflammation resulting in erythema, hyperpigmentation, and scar formation. In most cases, acne predominantly affects the face, and a considerable number of participants develop varying degrees of scars, that often corresponds to the severity of the grade of acne.

Acne scars arise due to a modified wound-healing process in reaction to inflammation of skin, with infiltrate of inflammatory cells detected in 77% of participants with atrophic scars.[4]

Numerous modalities have been implicated in the treatment of atrophic acne scars, ranging from invasive approaches such as subcision, punch grafts, surgical scar revision and excisions to less invasive approaches like autologous transfer of fat, the CROSS approach using 100% trichloroacetic acid (TCA), dermabrasion, electrosurgery, and dermal fillers. Non-invasive techniques consist of chemical peels, ablative laser, and non ablative laser therapy.[5]

Newer treatment options like fractional carbon dioxide laser, micro-needling radiofrequency are better than a few of the conventional treatments in providing better improvement, and better safety, without systemic administration.

Micro-needling Radiofrequency stimulates neo-collagenesis through insulated micro-needles, triggering growth factor release and collagen remodeling without harming the epidermis. It is a common alternative to laser treatments in darker skin tones, as it avoids post-inflammatory hyperpigmentation.[6]

The principle behind microneedling is to begin collagen synthesis with minute injury to the dermis by using micro needles. The damage these needles due to tissue is almost insignificant since they are so thin and tiny. Electrical signals known as the "nerve stimulus" trigger the healing cascade, releasing growth signals to undifferentiated cells and causing phase 1 inflammation to begin shortly after the injury. Fibroblasts move to the site of damage to aid in the closure of the wound and activate endothelial cells to cause neo-angiogenesis. The duration of this tissue remodeling process is eight weeks.

[7]

PRP holds autologous growth factors, potentially synergizing with those induced by skin needling to boost wound healing. This combined approach, involving skin needling and PRP application, is expected to enhance the effectiveness of both treatments. PRP includes high amounts of platelet growth factors, with an ideal platelet concentration exceeding 10 lakhs platelets/μL, resulting in 300–700% enrichment.[7]

I-PRF is a biomaterial of the second generation that is totally autologous obtained after centrifuging of whole blood. In addition to platelet growth factors like PRP, it even includes collagen type 1 lymphocytic growth factors. PRF membrane resembling a fibrin network is then formed, which has a three-dimensional structure which contains cellular components within. This structure facilitates the gradual and controlled growth factor release over time, prolonging its effects.[8]

Until now, there have been limited efforts directed towards utilizing MNRF in treating of acne scars. While MNRF shows potential in stimulating collagen remodelling and enhancing scar appearance, its specific application for acne scars has not been extensively explored. Nevertheless, given its ability to promote skin rejuvenation, MNRF remains an intriguing avenue for further investigation in the realm of acne scar management.

Combining MNRF with PRP offers an adjuvant approach to treating acne scars. MNRF stimulates collagen remodeling and dermal thickening, while PRP and I PRF provide growth factors that enhance the wound-healing response. Together, they may improve scar appearance and texture of skin, compared to either treatment alone.

While injectable PRF provides a sustained release of growth factors that further enhance tissue regeneration and remodeling. By synergistically addressing multiple aspects of scar formation and tissue repair, this combined therapy may offer improved outcomes for individuals with acne scars, potentially leading to smoother and more rejuvenated skin.

Therefore, the need of our study evaluated and compared the effectiveness of MNRF along with PRP versus MNRF along with I-PRF in treating acne scars. This study was done to determine which treatment approach yields optimal outcomes, offering valuable guidance for scar management strategies.

AIMS AND OBJECTIVES:

To evaluate the efficacy and safety of combining PRP with MNRF vs I-PRF with MNRF for post acne scars

REVIEW OF LITERATURE

ACNE VULGARIS

Acne vulgaris(acne) is a process of inflammation of the pilosebaceous gland. [3] It begins as microscopic comedones, which later become visible, clinically identified whiteheads or blackheads (comedones) on the forehead, often developing into inflamed red papules or pustules in adolescents. [9]

Because sebaceous follicles are more prevalent on the face, neck, upper back, and chest, acne most frequently develops in these areas. [3]

Most episodes of acne involve the face, and many individuals have some degree of scarring, the extent of which it is correlated with the acne grade. [10] Scars from these lesions may be atrophic or hypertrophic, complicating the situation. Therapy-resistant refractory cysts, nodules, and subcutaneous fistulas can also arise from acne. [9]

The pathogenesis of acne vulgaris involves several interconnected factors. Follicular hyperkeratosis, characterized by the abnormal accumulation of keratinocytes within hair follicles, contributes to the obstruction of follicular openings, leading to the formation of comedones. Moreover, alterations in the sebofollicular microbiome, the community of microorganisms residing within sebaceous follicles, play a role in acne development. Dysbiosis, or imbalance, within this microbiome, can exacerbate inflammation and lead to formation of acne lesions.

Increased production of sebum, is a hallmark feature of acne. This excess sebum production is influenced by various factors like insulin-like growth factor-1 (IGF-1) and androgens. IGF-1 not only directly stimulates sebum production but also promotes adrenal and gonadal synthesis of androgens, which further enhance sebum production.

Furthermore, alterations in the composition of sebum, particularly an increase in pro-inflammatory monounsaturated fatty acids, contribute to the inflammatory milieu within the pilosebaceous unit, exacerbating acne lesions.

In addition to these factors, inflammatory responses mediated by Th17 cells have a pivotal role in the causing acne. Th17 cells are a subset of T-helper lymphocytes which produce pro-inflammatory cytokines, which contribute in recruiting immune cells and the amplification of inflammation within acne lesions.

Understanding the complex interplay between follicular hyperkeratosis, dysbiosis of the sebofollicular microbiome, increased sebum production, and Th17-cell-mediated inflammation is crucial for developing targeted therapeutic strategies to effectively manage acne vulgaris. By addressing these underlying mechanisms, doctors can optimize therapeutic outcomes and improve the standard of living for people affected by acne.

Up to 95% of individuals dealing with acne face the challenge of post-acne scarring, which presents a lasting and disfiguring condition without a broadly effective solution. These scars stem from production of irregular collagen during the normal healing phase of active acne.[11]

Around 80-90% of individuals who develop acne scars have scars which are atrophic, marked by a reduction in collagen. In contrast, only a minority experience hypertrophic scars and keloids. [12]

Acne has serious effects on the afflicted people's social, psychological, and ultimately economic well-being. According to reports, the effects include depression with suicidal thoughts, high unemployment rates, and low self-esteem. [13–15]

EPIDEMIOLOGY

The prevalence rate in teenagers range from 35% to more than 90%. [16]

The study done by Global Burden of Disease Study 2010 revealed that acne is eighth most prevalent skin condition, that affects approximately 9.38% of total population across all age groups[17]

In a study involving 1013 Americans between the ages of 20 and 29, Elewski et al. discovered that the predominance of acne in men was 42.5% and women was 50.9%. [18]

Studying Chinese students from 2015, Zheng et al. discovered that about seventy-seven percentage of people gave a history of acne and that the age at the onset of the first incident was around 13.4+/- 1.4 years.

In research by Shah N et al, 68.3% of acne participants had persistent acne, making up 81.7% of the total patient population. The most prevalent type of acne was 72.8 percent inflammatory papular acne. The majority of affected areas were the cheeks (85%); 62.8% of individuals experienced scarring. [19]

In another study by Goulden V, Clark SM, and Cunliffe WJ on Post-adolescent acne, 48 (24%) men and 152 (76%) women were present. The participant's age was from 25 to 55 years old and had a mean age of 35.5The majority of participants had chronic acne, however, four (8.3%) of the men and 28 (18.4%) of the women had real late-onset acne, which appears beyond the age of 25. [20]

ETIOLOGY

The sebaceous glands are hypersensitive to normal amounts of androgens in the blood which lead to acne. The existence of Propionibacterium acnes (P acnes) and the ensuing inflammation worsens this process. [21]

Proposed contributory factors for acne include:

- usage of medications such as anticonvulsants, lithium and steroids
- overexposure to sun-light
- Use of tight clothing, including headbands, backpacks, shoulder padding, and underwire bras.
- oil-based makeup and massages for the face.
- endocrine conditions, including pregnancy and polycystic ovarian syndrome. It appears that edema of the pilosebaceous duct is followed by a premenstrual acne flare-up. 70% of participants who are female experience this.
- The branched fatty acid's amount in sebum is mostly determined by a few genetic factors; which has a heritability range of 50 to 90%.[22]
- repeated mechanical injury brought on by washing the afflicted area with soap and detergent. [23]
- Acne in adolescents has been connected to raised glycaemic load diets and higher milk consumption, according to several studies.

PATHOGENESIS

According to recent studies, the main causes of acne appear to be hormones, bacterial infections, inflammatory responses, and sebum secretion. Furthermore, diet, blood lipids and obesity are also associated with it. [24]

SEBUM :

Changes in sebum production is one of the most important reasons of acne formation. Changes in the components of sebum and increased sebum secretion relate to acne formation.[24]

Sebum is among the variables most closely linked to influence the occurrence of acne. The correlations between the content of sebum in the various regions of face (such as the T-, U-, and O-zones) vary.

- Individuals with acne, as opposed to those without it, showed notably elevated sebum levels in the nasal area.

Participants having acne demonstrated higher levels of sebum in the T-zone

In young participants with acne, who are less than the age of 25 years has higher levels of sebum in the U zone. But, in participants more than 25 years with acne, the sebum levels was more commonly observed in T zone.

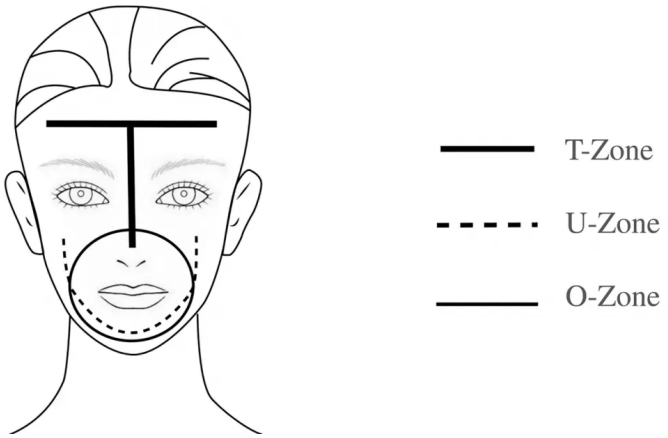

Figure 1: Facial regions-'T' zone, 'U' zone, 'O' zone

Some studies suggest that some components of sebum , more than the full content of sebum, are important factors in inducing development of acne.

The idea that raised levels of sebum causes more non inflammatory acne and inflammatory acne is controversial. Some researches also support that specific components of sebum, other than the overall amount, plays a definitive role in development of acne. [25]

HORMONES :

Higher testosterone levels and 5a-dihydrotestosterone levels are noted in participants who have acne, than in healthy people,[26] indicating a possible link between androgens and the formation of acne. High levels of androgen may increase sebum secretion, which could lead to acne, according to research[27]; however, other studies have suggested that sebum had no role in the androgen-induced development of acne.

Bakry et al.[28] discovered no discernible variation in sebum production between female acne participants who were non-obese and non-hirsute and normal persons. On the other hand, individuals with acne had higher levels of progesterone, free serum testosterone, serum sex hormone-binding globulin levels and total serum testosterone.

GENETICS :

Recent genetic studies have pinpointed crucial genes implicated in the development of acne. These include genes encoding enzymes such as steroid 5α-reductase type I (SRD5A1), 21-hydroxylase (CYP21A2), androgen receptor (AR). Recent genetic studies have revealed significant genes associated with acne development, including GHR,GH 1, IGF1, IGF 1R, IGFBP 3, FOXO1A, and various peroxisome proliferator-activated receptor (PPAR) genes like PPARA , PPARB , PPARG , PPARD , FGF-2 (FGF2), melanocortin receptor (MC5R, MC1R), (MMP1 , MMP2, MMP3, MMP9, MMP13), TNF-α (TNF), IL-1α (IL1A), and Toll-like receptors (TLR2 and TLR4) are also noteworthy factors implicated in formation of acne. [29,30]

HAIR CYCLES AND KERATINIZATION IN ACNE:

Abnormal keratinization plays a pivotal role in the acne formation by heightened hyperproliferative keratin expression like K6, K17, and K16 in acne lesions. [31] The expression of filaggrin in the infundibulum is seen in this process. [32,33]

Sebaceous gland: It shows heterogeneity in expression of keratin. Some lobules express a combination of keratins K5, K1, K10, K7, K17, and K14. Wall of comedone exhibits a keratin expression which has a similar pattern to the upper follicle, with additional expression of K6 and K16 keratins suprabasally, along with panepithelial expression of K17. This implies a distinct keratin profile in the comedone wall compared to other structures.

The heightened expression of keratins K17, K16, and K6 in the wall of comedone is suggested to be a result of increased turnover of cells due to the primary underlying mechanism of comedogenesis.

BACTERIAL INFECTION :

Propionibacterium acnes, is a lipophilic bacillus bacterium which is closely linked to acne, is known to amplify secretion of sebum, and thereby also amplifying inflammation. Few researches demonstrate that P. acnes extracts can stimulate production of sebum in sebaceous gland cells of hamsters. Additionally, P. acnes induce raised expression of proinflammatory factors like TNF-a, IL-1band IL-8 in monocytes. Furthermore, P. acnes can stimulate division of T cell, release pro inflammatory factors, and activate Toll like receptor (TLR)-2 in macrophages, contributing to inflammation.[34,35]

Staphylococcus epidermidis, commensals of skin plays a crucial role in limiting over-colonization and inflammatory responses caused by various P. acnes strains. This is achieved by the release of succinic acid, which suppresses IL-6 and TNF-a production by keratinocytes induced by P acnes.[36–40]

Reciprocally, P. acnes hinders the proliferation of S.pyogenes and S. aureus that maintains an acidic pH in pilosebaceous follicles. Disruption of the skin commensals, termed dysbiosis, can results in a compromised skin barrier, leading to inflammation and triggers innate immunity. In acne, dysbiosis is associated with dysseborrhoea and a modified P. acnes profile, exacerbating inflammation. TLR-2 expression raises with disease severity, and the interacts with P. acnes and TLR-2 stimulates cytokine production, MMP and defensins via PAR-2R activation[41,42], leading to heightened inflammation. Restoring the natural microbiome balance and skin barrier is a key focus in treatment of acne.

IMMUNOLOGICAL ASPECTS IN ACNE:

Immunological factors have a substantial role in the development of acne. Overgrowth of Propionibacterium acnes (P. acnes) in closed follicles triggers Langerhans cells and follicular keratinocytes through TLR-2, results in the formation of IL-8, IL-6, IL-12, and IL-1β(41). This activation results in inflammatory lesions like red papules and pustules. Initial inflammation happens before keratinization, and there's a shift towards Th1 response in acne lesions, with more Th1-positive cells present compared to normal skin. Th17 cytokines also play a role, with increased expression of IL-17 observed in acne lesions. Regulation of these cytokines IL-8, IL-6, IL-1β, TNF-α, and IL-17 , offers various strategies for acne treatment.[43]

To summarize, Acne, complex condition rooted in the pilo sebaceous unit, influenced by four key factors: increased sebum production, disrupted follicular keratinization, the pilosebaceous duct colonization by the anaerobic bacterium P acnes, and the release of inflammatory mediators into the skin. The interplay between these factors contributes to the development and persistence of acne lesions.[44]

Whereas acne scars typically arise due to a disrupted wound healing response triggered by cutaneous inflammation resulting from acne. In 77 percent of atrophic scars, there is evidence of inflammatory cell infiltrates. This suggests that the presence of these infiltrates plays a role in the altered healing process that leads to the formation of atrophic scars.[4]

These pathological process of acne triggers the inflammatory process in the infra infundibular region, leading to follicular rupture and the formation of perifollicular abscesses.

Following this, the wound-healing process is activated. Skin injury initiates a cascade of intricate events involved in wound healing, rendering it as the most intricate process. This

sequence involves the involvement of soluble chemical mediators, components of the extracellular matrix, and various resident cells including nerve cells, keratinocytes, Together, these cells are called immunoinflammatory cells; they include fibroblasts, endothelial cells, and blood cells that have invaded the body, such as neutrophils, lymphocytes, and monocytes. Both hypertrophic and atrophic scarring can appear at the site of tissue injury[45,46]

In participants predisposed to scarring, initial lesions show a lower count of cD4+ T-cells in comparison with individuals without scarring. This response is more pronounced in the resolution of lesions.[47]

WOUND HEALING :

The process of healing of wound progresses through 3 stages :

(1) INFLAMMATION:

Pale appearance due to vasoconstriction, aiding in haemostasis, followed by vasodilation and the emergence of erythema once blood flow resumes. This process can also trigger melanogenesis and is pivotal in post-acne hyperpigmentation and erythema. Various blood lines, including, macrophages, granulocytes, neutrophils, fibroblasts, lymphocytes, and platelets, become activated and release inflammatory mediators, preparing the for formation of granulation tissue. Upon viewing biopsy samples, Holland et al. observed that individuals with severe acne scars exhibited a more intense and prolonged inflammatory reaction seen at the pilosebaceous gland compared to those with-out scars. They established a clear co-relation among the extensiveness and time period of inflammation and development of scar. This underscores the potential effectiveness of early intervention in addressing inflammation in acne lesions to prevent scar formation.[47]

(2) FORMATION OF GRANULATION TISSUE : The recovery process entails repairing damaged tissues and the growth of new capillaries. Monocytes substitute neutrophils, which transform to form macro-phages that produce growth-factors like growth factor derived from platelets, fibroblast growth factors also alpha and beta transforming growth factor. They established a clear co-relation among the severity and duration of inflammation and development of scar growth factor, and transforming growth factors α and β. These growth factors initiate the multiplication of fibroblasts. Fibroblasts synthesise collagen which typically starts 3-5 days followed by the initial wound, with the skin primarily composed of type 3 collagen, accompanied by a tiny portion (20%)being type 1 collagen. As scars progress in maturity, the collagen makeup transitions to mimic uninjured skin, with about 80% being comprised of collagen type 1.[48]

(3) MATRIX REMODELLING: Keratinocytes & Fibroblasts release enzymes like matrixmetalloproteinases (MMPs) and tissue inhibitors of MMPs, influencing the structure of the extracellular matrix (ECM). MMPs, which degrade the ECM, participate in a breakdown cascade that contributes to remodelling of ECM. An imbalance in MMPs compared to inhibitors of MMPs results in the formation of hypertrophic scars or atrophic scars. Reduced reaction may lead to decreased collagen deposition, forming a scar which is atrophic, while an overly healing response produces a raised fibrotic tissue nodule, leading to hypertrophic scars.[49]

CLASSIFICATION OF POST ACNE SCARS :

Scars often develop due to consequence of damage of skin in the process of healing of acne that are active and are categorized as atrophic and hypertrophic scars based on alterations in collagen. The majority (80-90%) are classified as atrophic scars, marked by collagen depletion, while a smaller portion presents hypertrophic scars and keloids, distinguished by an overproduction of collagen.

These scars then are categorized as ice pick scars, box-car scars, and rolling scars. Among atrophic scars, the ice pick scars accounts for 60% –70% of all scars, rolling scars at 15–25% followed by boxcar scars at 20–30%. [50]

ICE-PICK SCARS:

Figure 2: Icepick scars

These scars are distinguished by their punctiform, deep nature and are narrow about 2mm in size. featuring openings that are usually wider than the infundibulum, resulting in a distinctive "V" pattern.

ROLLING SCARS :

Figure 3: Rolling scars

They are characterized by the attachment of the dermis and subcutis, typically wide than 4-5 mm. Scars like this create a rolling effect on the skin, resembling the pattern of the letter "M."

BOXCAR SCARS:

Figure 4: Boxcar scars

These are circular or oval scars having vertical edges. They are broader at the skin surface also lack the tapering V pattern. Instead, they exhibit a "U" pattern with a broad base, and their depth that varies from deep or shallow.

At times, individuals may display a combination of all three types of atrophic scars, making it challenging to distinguish between them. To address this complexity, several authors have suggested classifications and scales.

ACNE GRADING :

“EVALUATOR-BASED QUANTITATIVE GLOBAL SCAR GRADING SYSTEM”:

Based on this system, acne scars are graded based on type of scar-macular,mild,moderate,severe of scar into grade 1 to 4. In case of localised single area involvement referred as ‘A’ and in case of more than 1 area involvement categorized as ‘B’. [50]

Table 1: "Goodman and Baron qualitative scar grading system" [1] **:**

GRADE	LEVEL OF DISEASE	CLINICAL FEATURES
I	Macular	Erythematous,hypopigmented or hypopigmented flat lesions. Do not possess a contour problem
II	Mild	Hypertrophic scars or atrophic scars that is not visible at 50cm or higher
III	Moderate	Moderate hypertrophic or atrophic scar visible at distance of 50cm or more
1V	Severe	Severe hypertrophic or atrophic scarring highly obvious at distance greater than 50cm

"THE GOODMAN AND BARON QUALITATIVE GRADING SYSTEM" [1]

This assesses the severity and characteristics of acne scars.

This technique divides acne Scars in to several types upon their appearance and texture, such as ice pick scars, rolling scars and box car scars, and hypertrophic scars. Each type of scar is graded upon on its width, depth, and overall appearance. [1]

"GOODMAN AND BARON'S QUANTITATIVE ACNE SCAR GRADING":

A quantitative global acne scar grading system was also developed by Goodman and Baron which is a point-based system that used the type of scars were,

Macular and atrophic scars- One point

Moderately atrophic scars – Two points

Severely atrophic scars – Three points

Hyperplastic scars – Four points

This score is then multiplied by a constant factor depending on the count of lesion.[2]

one point =one-ten lesions

two points = eleven-twenty lesions

three points= more than twenty lesions

The score ranges from 0-84.

Type	Number of lesions: 1 (1–10)	Number of lesions:2 (11-20)	Number of lesions: 3 (> 20)
Milder scarring (A)	ONE POINT	TWO POINTS	THREE POINTS
Moderate (B)	TWO POINTS	FOUR POINTS	SIX POINTS
Severe ©	THREE POINTS	SIX POINTS	NINE POINTS
Hyperplastic (D)	TWO POINTS	FOUR POINTS	SIX POINTS

Table 2: "Goodman and Baron's quantitative acne scar grading"[2]

"ECHELLE D'EVALUATION CLINIQUE DES CICATRICES D'ACNE (ECCA)" [51]:

ECCA is a quantitative scale and is dependent on number of scars and type of scar.

The scar type further is divided based on morphological features. The count is determined by extent of scar and is made on 4-point scale. The total scar and extent of scar gives a final score ranging from 0- 54.[51]

O-Nil scars

I-Less than five scars

II-Between five and twenty scars

III-More than twenty scars

This technique evaluates the scarring extent for each kind of scar.[52]

"IMAGE BASED QUANTITATIVE MEASUREMENT OF ACNE":

Recently visual inspection of the extend of scar has become more popular due its objectivity and reproducibility.[57]

Few studies used 3D images where volumetric assessment was done of an individual scar and is calculated with the help of a computer.[53]

PSYCHOLOGICAL IMPACT OF ACNE SCARS :

Jerry Tan et al. formulated a self-assessment tool in their study that was utilised to measure the acne scar severity, alongside a commonly utilized generic measure of Health-Related Quality of Life (HRQOL) in dermatology, and DLQI.

Furthermore, they integrated a dedicated scale meant to assess acne scar impact on quality of life, known as the Facial Acne Scar Quality of Life (FASQoL) scale. This comprehensive approach meant to assess the effect of acne scars on patient well-being, regardless of the presence of active acne.

Based on the DLQI (Dermatology Life Quality Index) assessment, acne scars have a mean score being 6.26. This score indicates acne scars significantly impair Health-Related Quality of Life (HRQOL). Comparing this to other debilitating skin conditions, it's noteworthy that the impact of acne scars on HRQOL is comparable to conditions such as Darier's disease (DLQI 5.89), Behçet's syndrome (DLQI 5.7), Hailey–Hailey disease (DLQI 6.06), rosacea (DLQI 6.1), pityriasis rosea (DLQI 6.36) and cutaneous lupus erythematosus (DLQI 6.50), This comparison underscores the significant negative impact of acne scars on an individual's quality of life, placing them alongside other clinically significant dermatological conditions.[11]

TREATMENT OF ATROPHIC ACNE SCARS :

Prevention through early on management of active acne is one of the best treatment for acne scarring. [54.] Addressing inflammation is a vital feature in managing acne scars. Effective acne treatment can help reduce the intensity of inflammation and its duration, thereby minimizing the possibility of scar formation.

This underscores the importance of early and proactive management of acne in preventing the scar development. Furthermore, various interventions are available to reduce existing scars. These may include the following :

CHEMICAL PEELS :

Chemical peeling is when chemical solution are application is done on the skin to remove the outer layer damage and hasten skin's healing process.[55]

The level of penetration varies between different agents. Thus, chemical peels are divided based on the level of necrosis on histopathology.[56]

TCA CROSS :

Icepick and small boxcar scars are treated effectively by this method. Trichloroacetic acid CROSS, an abbreviation for "chemical reconstruction of skin scars," where high-concentration TCA is directly applied onto scars using wooden instruments(toothpicks) shaped to match the scar's contours. This procedure does not require local anaesthesia or sedation. Contrary to findings in existing literature recommending 90% TCA, few observations indicate that a lower concentration of TCA (50%) yields comparable results with significantly fewer adverse reactions.

Initially there is destruction of epithelial tract that is followed by collagen fibre formation that takes about 3-6 weeks. The process is performed at a gap of 2 to 4 weeks for two or three times.[52]

DERMABRASION :

Dermabrasion and microdermabrasion are techniques of resurfacing the facial skin that involve mechanically removing skin that is damaged, to initiate re-epithelialization. Though both methods entail mechanical abrasion of the skin, they employ different instruments and techniques.[57]

Dermabrasion removes the epidermis and reaches the reticular dermis or papillary dermis, prompting the restructuring of proteins present in the skin.

Micro-dermabrasion, a milder alternative, solely targets the outer epidermal layer, hastening exfoliation.[58]

SUBCISION :

Subcision is an efficient technique for treating rolling scars.This involves percutaneously inserting a Nokor needle close to the scar and passing it to the dermis underneath. By manipulating the needle, in to and fro fanning movements, fibrous tissue responsible for pulling down the scar and causing a depressed appearance is released.

Bleeding during subcision is essential for clot formation in the created space, which serves to elevate the skin from the underlying scar tissue. This clot helps maintain the elevation, allowing neocollagen production.[59]

NEEDLING :

Skin needling is a new technique involving a sterile roller with fine needles to puncture the skin. After disinfection and topical anaesthesia for 60 minutes, the roller is moved back and forth over acne scar-affected areas with pressure. Penetration is about 1.5 to 2 mm, causing temporary bleeding.

Micro bruises initiate growth factor cascades, leading to collagen production. Results appear after 6 weeks, with full effects taking three months. Improvements continue over a year due to gradual collagen deposition. Participants typically need about 3 treatments, spaced 4 weeks apart, depending on individual collagen response and desired results.[60,61]

PUNCH EXCISION AND PUNCH ELEVATION :

Punch excision followed by closure is technique for eliminating deep-pitted scars like ice-pick or deep boxcar types. It involves using a punch biopsy tool sized according to the scar's diameter to remove the scar tissue, followed by suturing for healing. The resulting scar may be less visible than the original deeper acne scar. Punch grafting thus offers a long-term result and is a good treatment option for ice-pick scars which are deep.[62]

Punch elevation is a combination approach which blends the aspects of punch excision and grafting. Instead of completely removing the scar, in punch elevation, the scar is punched and the skin is lifted and secured at a level flush with the skin's surface using steri-strips or sutures. This method is suitable in treatment of boxcar scars which are deep and have distinct edges and lesser than 3 mm of depth.[63]

LASER RESURFACING :

Laser skin-resurfacing has become more common as an efficient method in addressing acne scars. Laser therapy in acne scars refines the scar's texture and encourages collagen production in the affected area. Using resurfacing lasers for facial scar recontouring has gained popularity in recent times. These lasers function by selectively removing water-containing tissue, offering precise and consistent tissue vaporization in comparison to derma-abrasion. Nevertheless, complications that is associated with lasers causing resurfacing are prolonged period of recovery and significant risks of after effects, like

infection, pigmentation , and edema. To minimise these undesired outcomes, fractional lasers have been devised.

Initial fractional laser system introduced was a 1,550-nm Er: Glass laser, a non ablative fractional laser (NAFL) system. Energy of the laser that is administered onto the surface of the skin generates micro areas of thermal-injury reaching deep into reticular dermis, these are termed as MTZs i.e, microscopic thermal zones. Eventually, ablative fractional laser (AFL) systems, which utilize erbium-doped yttrium aluminum garnet (Er: YAG) or carbon dioxide (CO2) as a medium, have been developed to surpass NAFLs. AFLs not only create comparable thermal coagulation columns throughout the epidermis and dermis but also evaporates the stratum corneum.[64]

Carbon dioxide laser: CO2 laser resurfacing utilizes energy at a wavelength of 10,600nm.The absorbed energy results in accelerated heating and vaporization of tissue. Wound healing and collagenization are induced by heating of the dermis below the level of ablation.[65]

ERBIUM :YTTRIUM-ALUMINIUM-GARNET (ER:YAG) :

Er:YAG releases energy at 2940 nm wavelength. Due to short wavelength ten times more precise for water than CO2 Laser. The epidermis and superficial papillary-dermis absorb the released energy that results in a smaller portion of damage underneath the ablation level and in a more superficial ablation.[66]

NON ABLATIVE LASERS :

Nonablative lasers reduce side effects and the need for intricate post-operative care. They stimulate collagen formation in dermis while sparing the epidermis.

NEODYMIUM:YTTRIUM ALUMINIUM GARNET (ND:YAG) LASER:

Nd YAG laser benefits people with sensitive and dark skin. It emits light at infrared wavelengths. Thermal damage acts as a stimulus that releases inflammatory mediators, activates fibroblasts, neocollagenesis, and dermal remodeling.[67]

DIODE LASER :

This refers to a 1450nm laser of the infrared spectrum, which specifically aims at water molecules located in the upper layer of the dermis. This process aids in the generation of new collagen.[67]

FILLERS :

Injectable-fillers are used to enhance soft tissue.

Fillers which last for fewer months are temporary fillers that require recurrent sessions thereby increasing the cost. Hyaluronic acid triggers collagen production, augments the soft tissue and maintains overlying skin quality[68]

Semi permanent fillers stimulate production of fibrous tissue and poly-t-lactic acid that can last for 2 years.[69]

Permanent fillers contain large particles and hence cannot be phagocytosed and last for many years. Silicone though is cheaper, permanent side effects can be there that might require complete removal.[68]

MICRONEEDLING RADIOFREQUENCY :

The advent of MNRF is anticipated to address the constraints associated with fractional-lasers.

PRINCIPAL OF MNRF :

MNRF is a cutting-edge system that utilizes both mono- and bipolar radiofrequency energy to generate heat within the skin and subcutaneous tissue. This heat is produced through the resistance encountered by the electrical current as it passes through these tissues. This technology offers a precise and controlled method for delivering therapeutic heat, making it suitable for a wide range of dermatological treatments with minimal damage to surrounding tissues.[70]

Fractional-RF energy across various electrodes which are insulated ensures that regions of regulated damage are encircled by areas of unaffected tissue. This method aims to decrease discomfort, shorten recovery periods, and accelerate healing. This technique enhances treatment safety and efficacy by selectively delivering RF energy to targeted areas while preserving neighbouring tissues. It represents a notable advancement in dermatological procedures, providing participants with better results and a more pleasant treatment experience. [71]

One advantage of fractional radiofrequency is its minimal epidermal disruption, typically less than 5%, in contrast to the 10%–70% disruption caused by fractional ablative laser systems.[72]

Salient differences of MNRF in comparison with fractional-lasers include :

1. Suitable for All Skin Types: Insulated MNRF is safe to be used on all types of skin, with minimal risk of burns and PIH, especially in individuals with skin tone that are darker.

2. Precise Energy Delivery: RF energy is concentrated precisely at the tips of microneedles in insulated MNRF, resulting in minimal injury to the epidermis. This leads to significantly less downtime and pain for participants compared to conventional CO2 fractional lasers.

3. Adjustable Penetration Depth: The penetration depth of micro needle must be set from 0.5mm -3 mm with insulated MNRF, allowing for effective treatment of deeper scars. In contrast, the safe depth achieved with fractional lasers in dark-skinned individuals is typically limited to 1 to 1.5 mm.

These features highlight the versatility, precision, and effectiveness of MNRF in treating a variety of skin concerns like acne scars, with minimal risk and discomfort for participants of all skin types. [73]

MNRF PARAMETERS :

MNRF energy delivery system has a 49 goldplated disposable micro needle electrodes which has a maximum energy output of 50W. The depth of the needle can range from a 0.5mm minimum to 3.5mm maximum. Upon reaching the regulated depth by the needle, the radiofrequency is emitted that heats only the dermis while epidermis is spared.

PLATELET RICH PLASMA :

PRP is a portion of plasma containing a higher number of platelets than whole blood, typically ranging from 3 to 7 times the platelet concentration found on an average in whole blood.[74]

Wound healing is activated by growth factors released by platelet :

- Vascular endothelial growth factor (VEGF)[75]
- Epidermal growth factor(EGF)[75]
- Platelet derived growth factor(PDGF) [75]
- Transforming growth factor(TGF)[75]
- Insulin like growth factor(IGF-1)[75]
- Fibroblast growth factor(FGF)[75]

- Connective tissue growth factor(CTGF)[75]

Platelet activation initiates degranulation, followed by the bioactivation of secretory proteins. These activated proteins are released which attach to transmembrane receptors on target cells such as fibroblasts, osteoblasts, mesenchymal stem cells, epidermal cells, and endothelial cells. This binding activates intracellular signaling proteins, which induce cell proliferation, osteoid production, matrix formation, and collagen synthesis.[75]

Preparation :

PRP is derived from a patient's blood sample collected during treatment. Typically, when a 30 ml venous blood is drawn 3-5 ml of PRP is produced , varying depending on the individual's platelet count at baseline, the specific machine used, and the method employed. An anticoagulant, like citrate dextrose A is added to prevent activation of platelets before its use.[76]

PRP method :

The first centrifugation step forms a layer of RBCs separating it from the remaining whole blood, resulting in three separate layers: an uppermost layer with platelets and white blood cells (WBCs), middle layer consists of buffy coat excess in White Blood Cells, and a lowermost part has RBCs. In the second centrifugation step, soft pellets form at the bottom. The upper portion that has less platelet plasma is removed, and the pellets are combined with the lowermost plasma to create PRP.

USES OF PRP IN DERMATOLOGY :

- Alopecia areata
- Striae distensae
- Acne and traumatic scar
- Sin rejuvenation

- Dermal augmentation
- Vitiligo
- Melasma

Safety of PRP :

True PRP being an autologous preparation does not not have any major side effects. It does not have the risk of Hepatitis B,C or IHV transmission. Occasionally it may cause local injection site reactions and secondary infections.

INJECTABLE PLATELET RICH FIBRIN :

I-PRF also known as Fluid PRF represents a second-generation, entirely autologous biomaterial derived from blood. It possesses a three-dimensional meshwork of fibrin akin to that found in a PRF clot, while maintaining a fluid consistency like PRP. In addition to platelets and their growth factors, I-PRF primarily contains collagen type-1 and lymphocytes and their respective growth factors. Concerns have arisen regarding the use of anticoagulants in PRP, as they may pose a risk of hypersensitivity reactions. Injectable PRF addresses this concern by eliminating the need for anticoagulants. As a result, it is a fully autologous biomaterial with minimal risk of hypersensitivity reactions.

A distinctive characteristic of Injectable PRF is its ability to remain in a liquid state for approximately 20 minutes before undergoing fibrin polymerization, resulting in the formation of a solid membrane. This membrane comprises cellular components spread within the fibrin mesh network. This property facilitates a gradual and sustained production of growth factors, prolonging the duration of its effects.[83]

However, it has been observed that the growth factors in PRP are released predominantly within the initial 15 minutes post-injection, necessitating multiple sittings at regular intervals.[77]

In contrast, I-PRF contains platelets, B lymphocytes, monocytes stem cells, neutrophils, and growth factors in a fibrin meshwork. This unique meshwork is an important element in healing, working synergistically with cells and growth factors. This characteristic of Injectable PRF may contribute to a more sustained release of growth factors, potentially requiring fewer treatment sessions and providing longer-lasting effects compared to PRP.[78,79]

Preparation of I-PRF :

30 ml of whole venous blood is drawn from the antecubital vein. The blood is collected into 2, 15 ml sterile conical-bottom centrifuge plastic tubes without the addition of any anticoagulant. These tubes are then immediately placed diametrically opposite each other. The centrifugation is carried out at 800 revolutions per minute for 4 minutes. After centrifugation, these tubes are taken out, and the upper orange-yellow liquid obtained is the I PRF. Around 1 ml of I PRF is formed for every 10 ml of blood used in the procedure. Injectable PRF develops a consistency of gel approximately 20 minutes after centrifugation. This gel fills hollows and lines, providing a temporary filling effect that typically lasts for about 12-14 days before gradually diminishing. As such, Injectable PRF can also serve as a temporary filler in specific conditions.

I-PRF MERITS :

The preparation and application of I PRF are straightforward and do not require any biological alterations. It promotes the movement of cells and entrapment of cytokines. Most of the medication is in injectable form, reducing potential risks. Furthermore, it enhances the production of growth factors, leading to better activation of regenerative cells. It also forms a small fibrin clot, allowing it to function as a dynamic gel. Importantly, it is a simple and economical procedure, accessible to all regardless of financial

circumstances. Moreover, it plays a crucial role in releasing growth factors for a period of 10 to 12 days.

DEMERITS :

A significant drawback of I PRF is that it is only suitable for the donor due to the presence of highly antigenic plasmatic chemicals and circulating immune cells. Also, if stored, I-PRF may become contaminated with germs if not used immediately.[80]

MATERIALS AND METHODS:

- Study source: The study performed at the Dermatology, Venereology and Leprosy department in tertiary care hospital, Belgaum as a part of the MD curriculum.
- Duration of the study: The study was done for 1 year, spanning from January 2023 to December 2023.
- Ethical clearance: Clearance was taken from the Ethical committee of the institute.
- CTRI no : CTRI/2023/02/049617
- Study design: Open label, Comparative, Interventional hospital-based study
- Sample Size: The formula used for sample size calculation was,

$$n = \frac{(Z_{1-\alpha/2} + z_{1-\beta/2})^2 (p_1q_1 + p_2q_2)}{(p_1-p_2)^2} \times 1.3$$

$$= \frac{(1.96+1.64)^2 (3x97) + 36 \times 64}{3-36} \times 1.3$$

$$= 40$$

Confidence Interval : 95 %

Power: 96 %

Attrition : 30 %

$1-\alpha/2 = 1.96$; $p1 = 3$; $p2 = 36$

$1-\beta/2 = 1.64$; $q1 = 100-p1$: $q2 = 100-p2$

- Inclusion Criteria:

-Participants aged between 20 and 40 years

-Fitzpatrick skin types 2 to 5

- Goodman and Baron Grades II, III, and IV were taken in the study.

- Criteria of exclusion:

  -Individuals with keloid scars or a tendency to develop keloids

  - bleeding disorders or undergoing anticoagulant therapy

  -oral steroid medications

  -active skin infections such as herpes, warts or bacterial infections

  -pregnant and lactating individuals

- Data collection procedure:

  -Informed consent was taken from all participants.

  -Each patient underwent a thorough assessment including medical history, physical examination, and dermatological evaluation, with data recorded by a solo examiner in a case proforma.

  -Acne scars on right side and left sides of the face were graded using the Goodman and Baron qualitative scale[1] and quantitative scale[2], and participants were briefed on intervention details, anticipated outcomes, duration, follow-up, side effects, and prognosis.

  -Digital photographs were taken at the start of the study, after each treatment session and at the end of 12 weeks under standardized conditions.

  -Topical anaesthetic cream was applied 45 minutes before the procedure.

  -Microneedling radiofrequency DERMA INDIA MR 16-2SB : Using 49 gold-plated disposable micro needle, three passes were done at depths of 2mm, 1.5mm

and 1 mm with a maximum energy output of 50W. The time of needles being out was set as 300ms and time difference of radiofrequency and needles being out was set as 2ms for each session.

-Platelet rich Plasma : 5 mL blood was taken in one vial having 1.5-ml ACD in 8.5-mL BD Vacutainer and is centrifuged at 15 minutes at 3600 rotations per minute.

-Injectable Platelet Fibrin : 5 ml blood was taken in sterile conical bottom centrifuge plastic tubes and centrifuged at 800 rotations per minute for 4 minutes

-Side effects were monitored, and participants received post-procedure antibiotics, sun protection advice, and sunscreen recommendations.

-After 12 weeks, digital photographs were compared, and acne scars were re-graded using Goodman and Baron's quantitative grade.

- Patient self-assessment was done using visual analogue scale.

-Physicians categorized improvement according to physician assessment grades.

- Statistical Method for data analysis:

— The observed and patient-reported baseline and at the end of study was entered in MS Excel (Bellevue, WA, USA)

— Analysed using appropriate statistical methods with Statistical Package for the Social Sciences software (IBM Corp., Released 2016. IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp.).

— The significance of the key outcomes of the study was assessed by calculating the P value, and the value of $P < 0.05$ was considered statistically significant.

RESULTS :

Statistical analysis:

The data collection done from participants were added into Microsoft Excel and then analysed using SPSS version 17.0. Participant demographics, such as age and duration of scars, were categorised and presented as percentages alongside mean and standard deviation values. Qualitative variables, including gender, Fitzpatrick skin type, sunlight exposure, sunscreen use, cosmetics usage, scar site, scar type, Goodman and Baron's qualitative scores, visual analogue scale scores, physician assessments, and adverse effects, were summarised as proportions.

Goodman and Baron's quantitative scores were presented as mean and standard deviations. Statistical comparisons were conducted using appropriate tests; specifically, the chi-squared test was employed to compare Goodman and Baron's qualitative scores, VAS, physician assessments, and adverse effects. The comparison was done between right and left sides, and before treatment and after treatment. Additionally, an independent t-test was used to compare Goodman and Baron's quantitative scores between both sides. Graphical representations were utilized, including pie charts and bar diagrams. A p-value of less than 0.05 was considered statistically significant in all analyses.

Results:

43 individuals with acne were taken for our current research. The mean age of the participants was 27.7 years, with a standard deviation of 4.1 years. The age of the participants ranged from 21 to 37 years.

Table 3: Distribution of study participants by age (Years)

Age groups (years)	Number	Percentage
20-25	13	30.2
26-30	22	51.2
>30	8	18.6
Total	43	100.0

Among the total sample, the majority were within the age range of 26 to 30 years, about 51.2% of the total sample. Following this, individuals aged 20 to 25 years represent 30.2% of the population. Notably, those aged over 30 years comprise the smallest proportion at 18.6%.

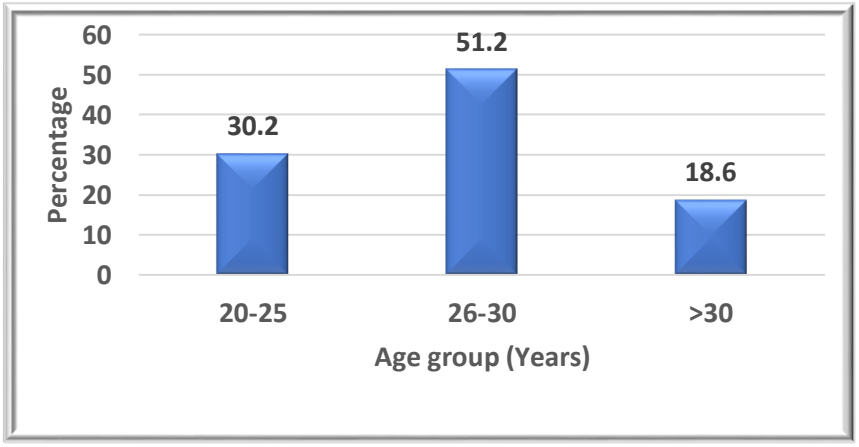

Figure 5: Distribution of study participants by age (Years)

Table 4: Distribution of gender among the study participants

Gender	Number	Percentage
Female	23	53.5
Male	20	46.5
Total	43	100.0

The table presents the gender distribution within a sample population, indicating that females constitute the majority at 23 (53.5%), while males represent 20 (46.5%) of the total sample.

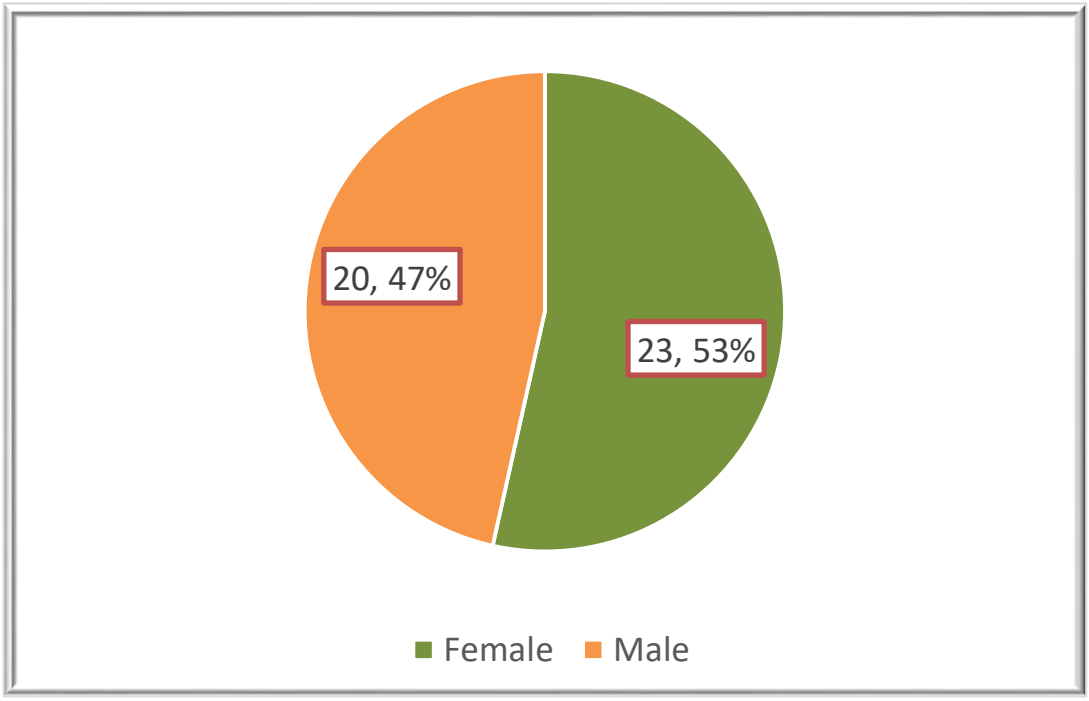

Figure 6 : Gender distribution

Table 5: Distribution of study participants by the duration of scar (years)

Duration of the scar (Years)	Number	Percentage
Up to 5 Years	15	34.9
6-10 Years	26	60.5
>10 Years	2	4.7
Mean (SD)	6.4	2.1

Among the total sample of 43 individuals, the majority, 26 (60.5%), displayed scars with a duration spanning between 6 to 10 years and 15 (34.9%) participants, exhibited scars that are up to 5 years old, A minor proportion, 2 (4.7%), showcased scars exceeding 10 years in duration. The mean (SD) duration of the scar was 6.4 (2.1) years

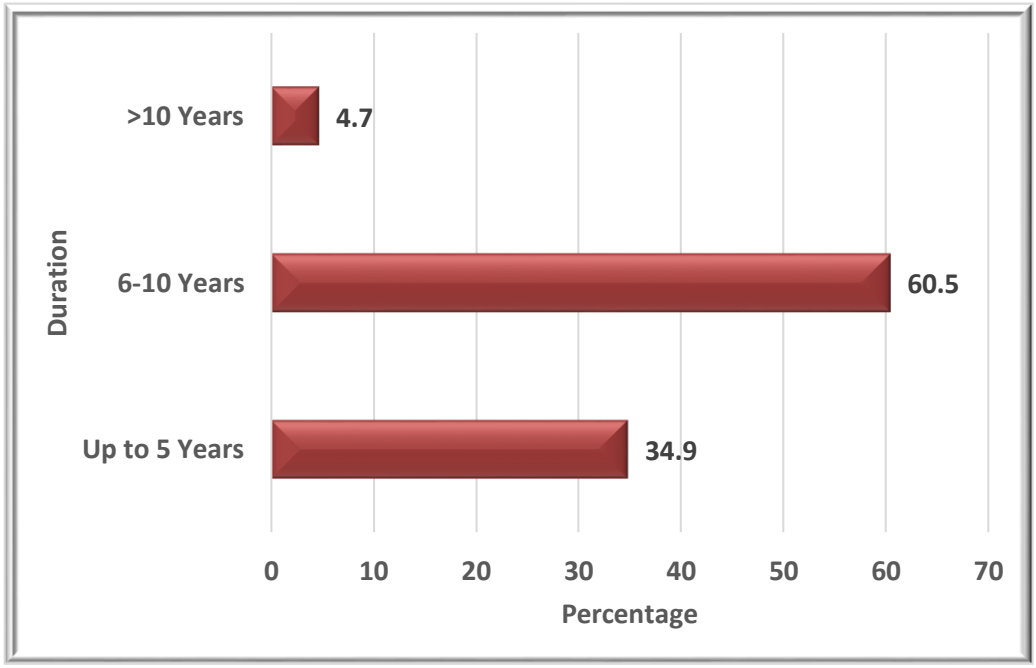

Figure 7: Distribution of study participants by the duration of scar (years)

Table 6: Distribution of study participants by Fitzpatrick skin type

Fitzpatrick skin type	Number	Percentage
II	17	39.5
III	18	41.9
IV	8	18.6
Total	43	100.0

Within the sample of 43 individuals, nearly half (41.9%) of the sample was Fitzpatrick skin type III, and 39.5%, were classified as Fitzpatrick skin type II. The remaining 8 (18.6%) of the participants, belonged to skin type IV.

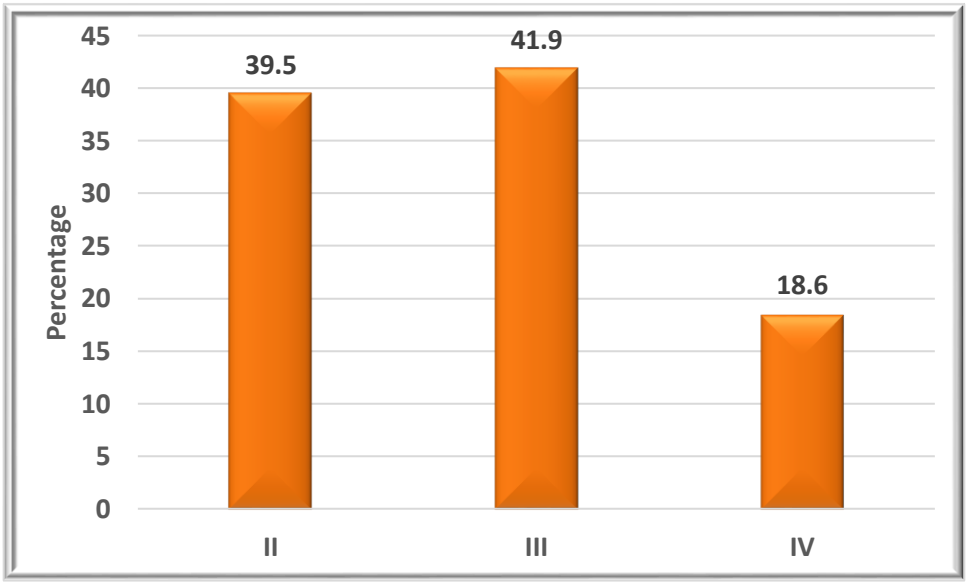

Figure 8: Distribution of study participants by FITZPATRICK skin type

Table 7: Details on sunlight exposure, usage of sunscreen, and use of cosmetics among the study participants

Sunlight exposure	Number	Percentage
Yes	40	93.0
No	3	7.0
Use of sunscreen		
Yes	25	58.1
No	18	41.9
Use of cosmetics		
Yes	27	62.8
No	16	37.2

This table reveals that 40 (93.0%) of participants reported sunlight exposure, with 25(58.1%) of them using sunscreen and 62.8% using cosmetics. Additionally, 7.0% of participants reported no sunlight exposure, with 41.9% of them not using sunscreen and 37.2% not using cosmetics.

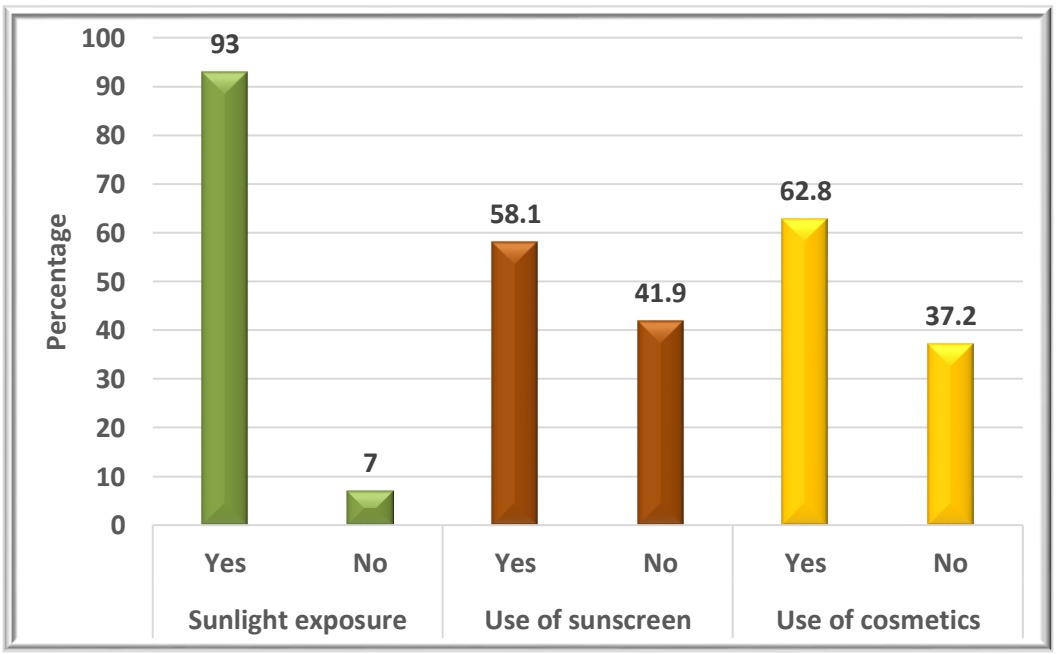

Figure 9: Details on sunlight exposure, usage of sunscreen, and use of cosmetics among the study participants

Table 8: Distribution of study participants with the presence of site of scar

Site of the scars	Number	Percentage
Cheek	43	100.0
Temporal	36	83.7
Frontal	23	53.5
Nose	14	32.6
Chin	14	32.6
Frontal & Temporal	18	41.9
Frontal & Cheek	23	53.5
Frontal & Nose	9	20.9
Frontal & Chin	7	16.3
Frontal, Temporal, and Nose	9	20.9
Frontal, Chin, and Nose	5	11.6
Frontal, Chin, and Temporal	7	16.3

Predominantly, scars were most prevalent on the cheek, exhibiting a 100% occurrence rate, followed closely by the temporal region, where scars were identified in 83.7% of cases. Frontal scars accounted for a substantial proportion at 53.5%, while scars on the nose and chin were observed at rates of 32.6% each. The data highlighted the co-occurrence of scars across facial locations, with notable combinations including frontal and temporal (41.9%), frontal and cheek (53.5%), and frontal and nasal (20.9%). Additionally, scar patterns exhibited simultaneous presence across multiple regions, with 20.9% of cases manifesting scars across frontal, temporal, and nasal areas.

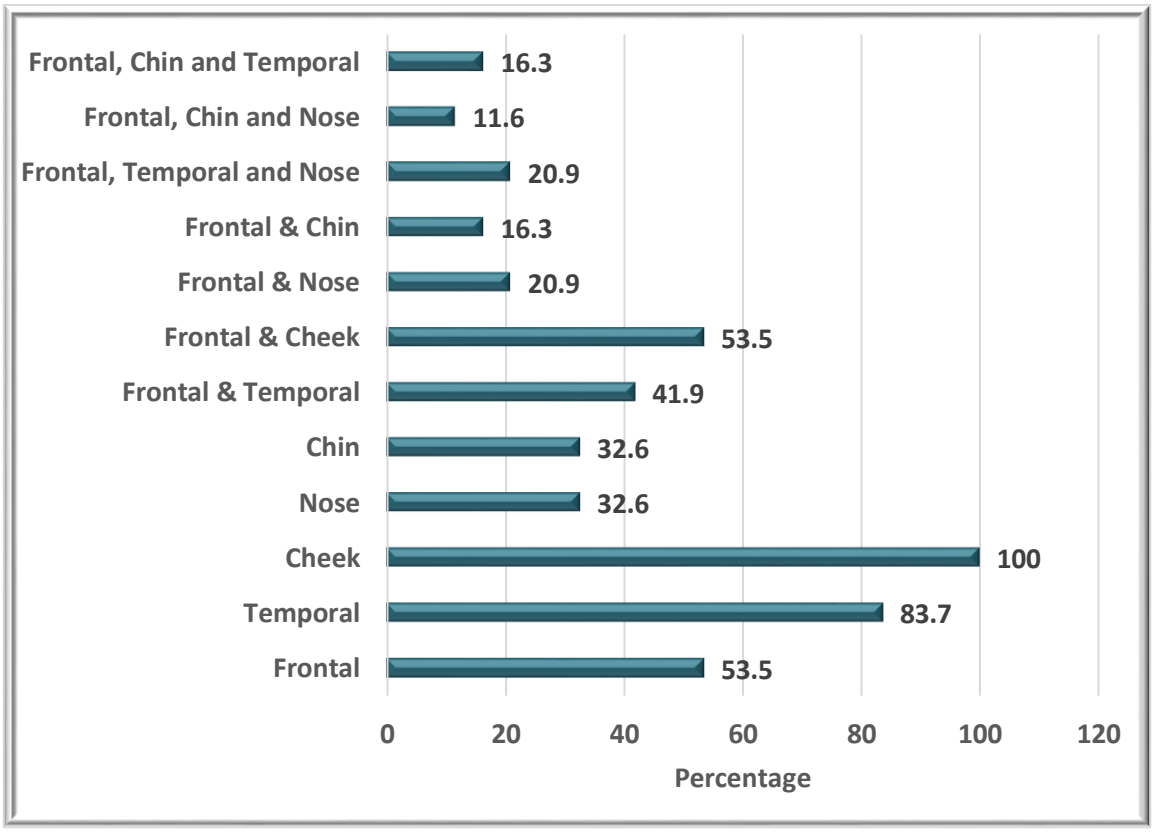

Figure 10: Distribution of study participants with the presence of site of scar

Table 9: Distribution of study participants with type of scar

Type of scars	Number	Percentage
Rolling	40	93.0
Box scar	29	67.4
Ice pick	36	83.7
Box and Ice pick	22	51.2
Box and Rolling	27	62.8
Rolling and Ice pick	35	81.4
Box, rolling, and Ice pick	22	51.2

Rolling scars exhibited the highest prevalence, with 93.0% of observed cases falling into this category. Following closely behind were ice pick scars, with an 83.7% occurrence rate. Box scars were also prevalent, comprising 67.4% of the observed scars. Interestingly, the data highlighted the co-occurrence of different scar types, with combinations such as box and ice pick (51.2%), box and rolling (62.8%), rolling and ice pick (81.4%), and box, rolling, and ice pick (51.2%) being notable.

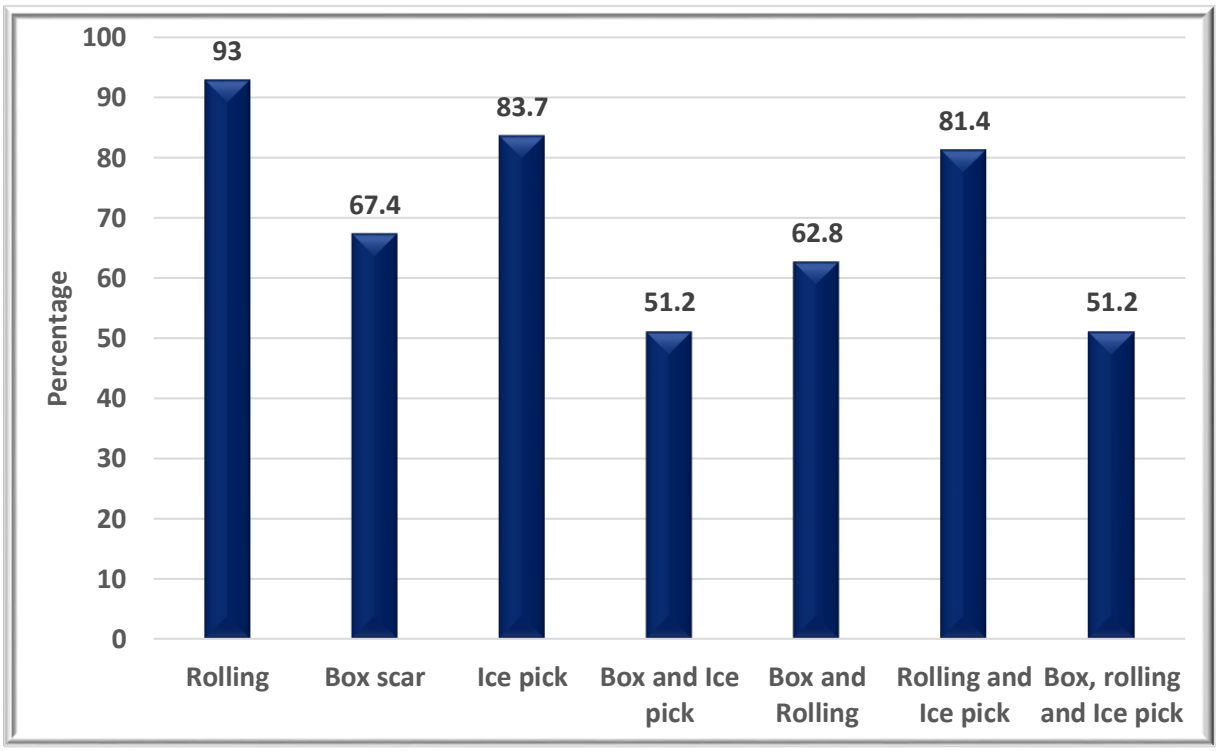

Figure 11: Distribution of study participants with type of scar

Table 10: Comparison of Goodman and Baron quanlitative scores between both the sides of the face at baseline and at the end of the study

Time point	Goodman and Baron's qualitative scoring	Right side		Left side		P value
	Grades	**n**	**%**	**n**	**%**	
Before	Moderate	21	48.8	21	48.8	0.44
	Severe	22	51.2	22	51.2	
After	Mild	12	27.9	11	25.6	0.41
	Moderate	26	60.5	25	58.1	
	Severe	4	9.3	7	16.3	
	Hyperplastic	1	2.3	0	-	
P value		0.01		0.05		

Initially, in the baseline, a significant proportion of subjects exhibited severe scarring on both the right and left sides, with 51.2% prevalence. Following intervention, there was a discernible shift in scar severity, with a decrease in severe cases and an increase in mild and moderate presentations. However, statistical analysis indicated that these changes did not reach significance, with p-values of 0.41 for the right side and 0.44 for the left side.

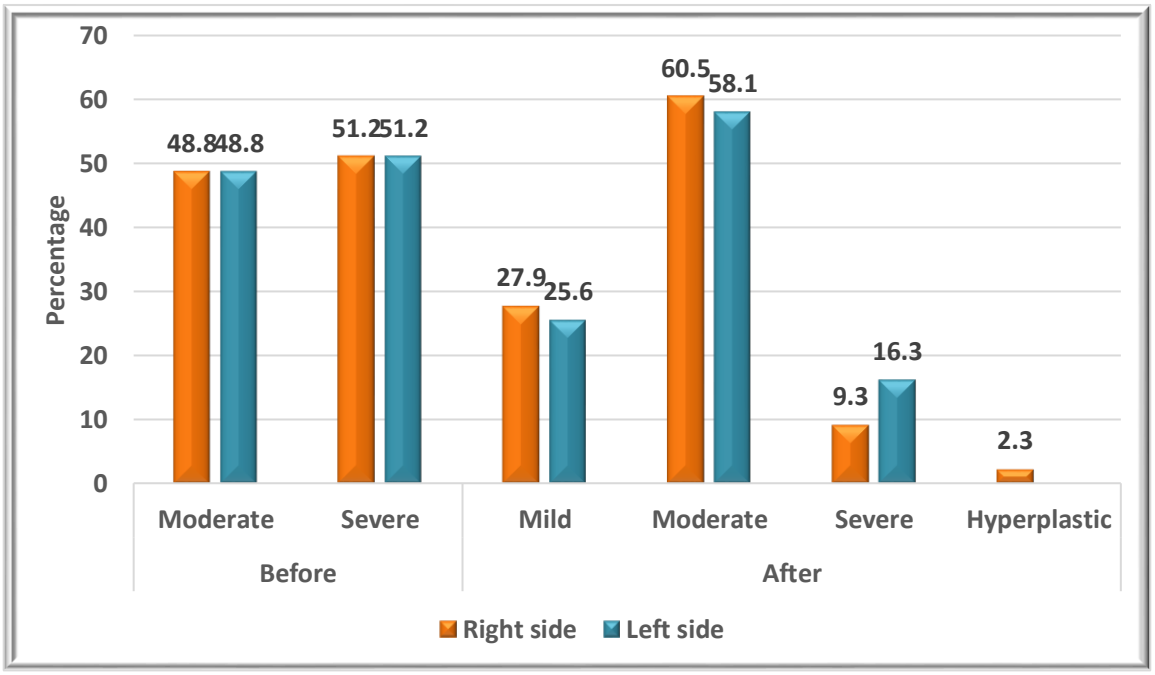

Figure 12: Comparison of Goodman and Baron qualitative scores between both the sides of the face at baseline and at the end of the study

Table 11: Comparison of Goodman and Baron quantitative scores between both the sides of the face at baseline and at the end of the study

	Goodman and Baron's quantitative scoring				
Time point	**Right side**		**Left side**		**P value**
	Mean	**SD**	**Mean**	**SD**	
Before	10.7	1.9	10.5	2.0	0.40
After	6.6	1.5	6.6	1.6	0.91
P value	<0.001		<0.001		
Change in score between before and after	4.1±1.5		3.9±1.5		0.32

Baseline mean scores of above-mentioned scoring system was 10.7 and 10.5 on the right and left sides, respectively, with standard deviations of 1.9 and 2.0, respectively. At the end of 12 weeks of study, there was a notable reduction in mean scores of qualitative scores, indicating improvement in scar severity, with mean scores of 6.6 and 6.6 on the right and left sides, respectively, and minimal changes in standard deviations. Statistical analysis confirmed these changes as highly significant ($p < 0.001$) for both sides. Additionally, the change in scores on comparing at baseline and the end of the study was calculated to be 4.1±1.5 on the right side and 3.9±1.5 on the left side, although this difference did not reach statistical significance ($p = 0.32$).

Figure 13: Comparison of Goodman and Baron quantitative scores between both the sides of the face at baseline and at the end of the study

Table 12: Comparison of VAS scores between both the sides of the face at baseline and at the end of the study

Time point	VAS score	Right side		Left side		P value
	Grades	n	%	n	%	
Before	10-25% improvement	20	46.5	18	41.9	0.70
	25-50%	23	53.5	25	58.1	
After	25-50%	1	2.3	2	4.7	0.59
	50-75%	24	55.8	28	65.1	
	>75%	18	41.9	13	30.2	
P value		<0.001		0.03		

Initially, before the intervention, the majority of participants reported moderate improvements, with 46.5% and 41.9% on the right and left sides, respectively, indicating a 10-25% improvement. A substantial proportion also noted improvements ranging between 25-50%, accounting for 53.5% on the right side and 58.1% on the left. In the end, significant shifts were observed, with fewer participants reporting minimal improvements and a notable increase in the percentage of individuals reporting substantial improvement. Specifically, after the intervention, a larger proportion noted improvements between 50-75% (55.8% on the right side and 65.1% on the left), and over 75% (41.9% on the right side and 30.2% on the left) while a marginal number reported 25-50% improvement (2.3% on the right side and 4.7% on the left). Statistical analysis revealed significant differences before and after intervention, with p-values of less than 0.001 for the right side and 0.03 for the left side.

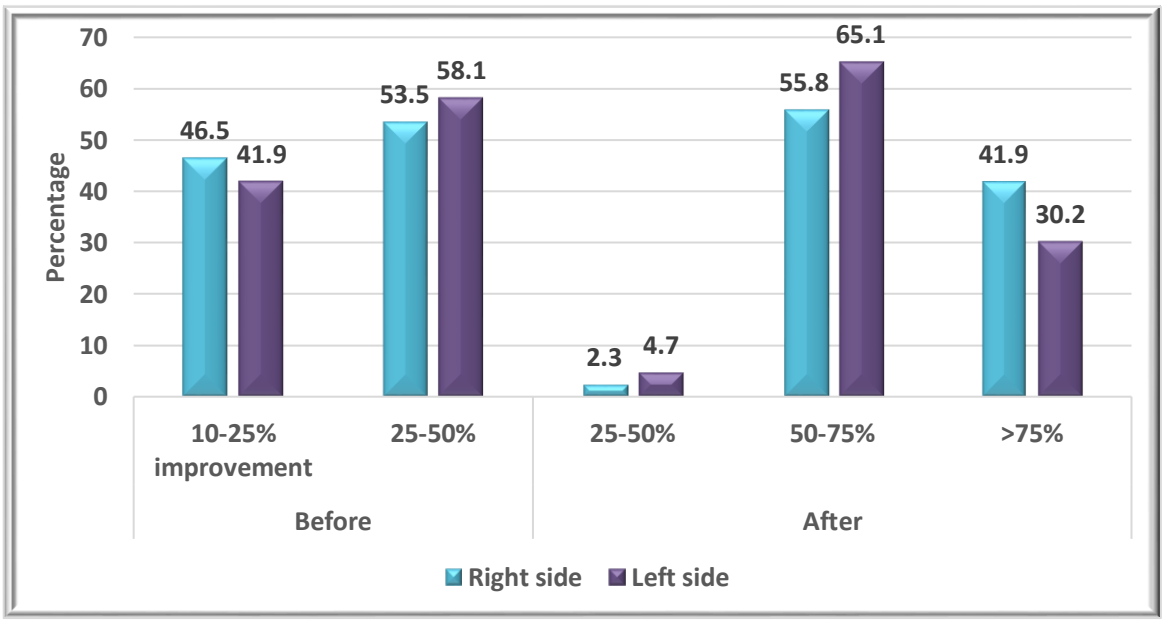

Figure 14: Comparison of VAS scores between both the sides of the face at baseline and at the end of the study

Table 13: Comparison of physician assessment scores between both the sides of the face at baseline and at the end of the study

Time point	Physician assessment	Right side		Left side		P value
	Grades	n	%	n	%	
Before	Grade I	18	41.9	17	39.5	0.76
	Grade II	25	58.1	19	44.2	
	Grade III	0	-	7	16.3	
After	Grade II			2	4.6	0.67
	Grade III	15	34.9	26	60.5	
	Grade I	28	65.1	15	34.9	
P value		0.64		<0.001		

Initially, at the baseline, a significant proportion of participants were classified as Grade II improvement according to Physician assessment grade, on both the right (58.1%) and left (44.2%) sides, while Grade I improvement were, accounting for 41.9% on the right and 39.5% on the left. Notably, Grade III improvement were reported on the right side was 0 %, while it was 16.3% on the left side.

At the end of the study, there was a discernible shift in scar grading, with Grade II improvement decreasing in frequency, particularly on the left side where only 4.6% remained, though this change was not statistically significant ($p = 0.67$). Conversely, Grade III improvement increased at the end of the study, with 34.9% and 60.5% on the right and left sides, respectively, representing a statistically significant difference compared to the baseline ($p < 0.001$). Moreover, Grade IV improvement also increased at the end of the study, with 65.1% on the right side and 34.9% on the left side.

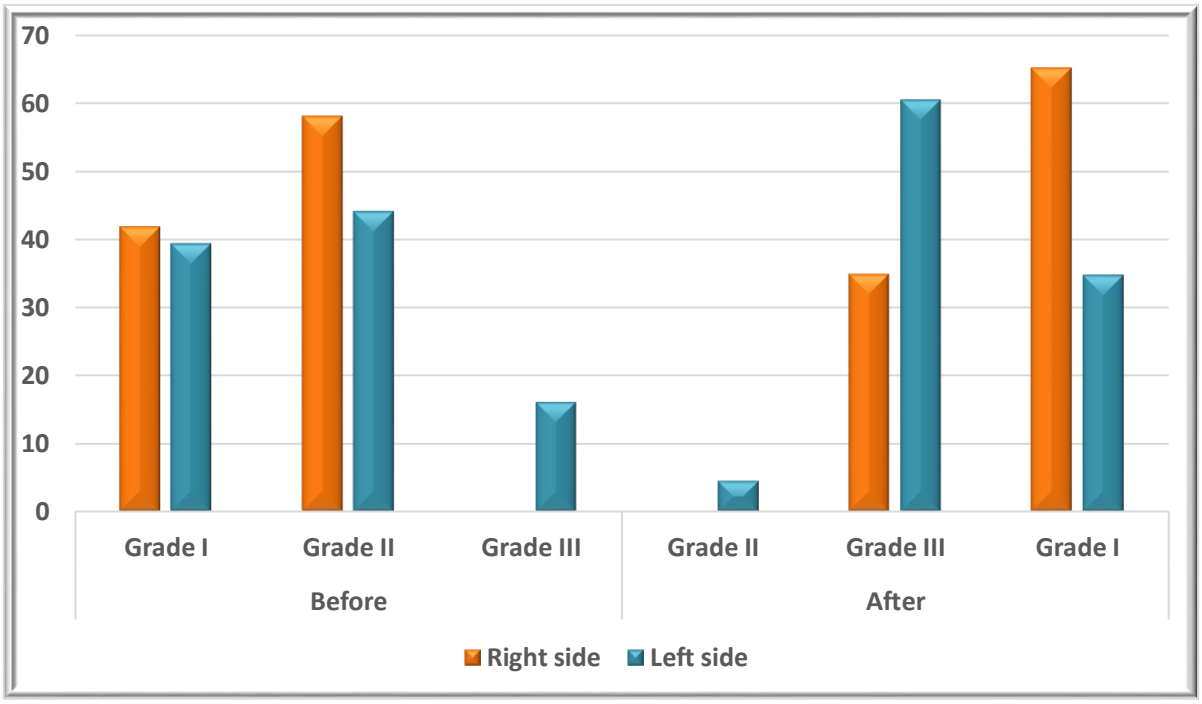

Figure 15: Comparison of physician assessment scores between both the sides of the face at baseline and at the end of the study

Table 14: Comparison of adverse effects between both sides of the face

Adverse effects	Right side		Left side		P value
	n	%	n	%	
Erythema	43	100.0	42	97.7	-
Edema	19	44.2	29	67.4	0.90
Pigmentation	19	44.2	21	48.8	0.86
Burning	29	67.4	5	11.6	0.70
Scabbing	28	65.1	35	81.4	0.06

Erythema was uniformly reported across all participants, indicating a 100% prevalence on the right side and 97.7% on the left side. Edema was noted in a substantial proportion of cases, with prevalence rates of 44.2% on the right side and notably higher at 67.4% on the left side, though this difference did not reach statistical significance (p = 0.90).

Similarly, pigmentation was observed in comparable proportions on both sides, with rates of 44.2% and 48.8%, respectively, and no significant difference between them (p = 0.86). Burning sensations were reported by a majority of participants on the right side (67.4%), whereas a much lower proportion experienced this on the left side (11.6%), although this difference was not statistically significant (p = 0.70).

Notably, scabbing was reported by a substantial number of participants on both sides, with rates of 65.1% on the right side and 81.4% on the left side, approaching statistical significance (p = 0.06).

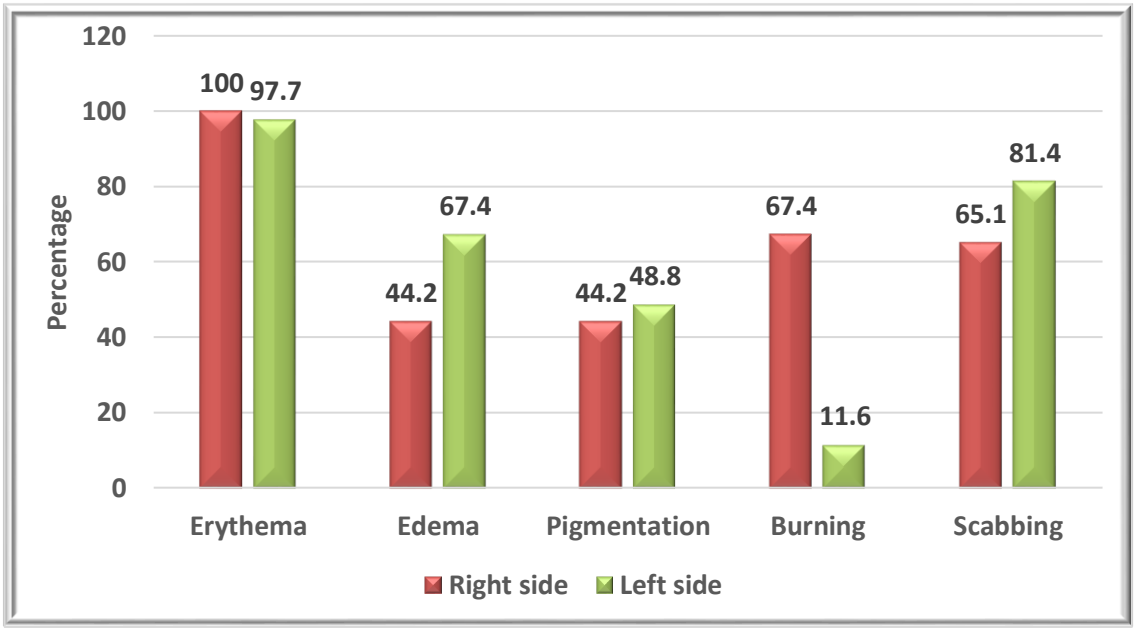

Figure 16 : Comparison of adverse effects between both sides of the face among the study participants

DISCUSSION

The present study is a split face, prospective, interventional study conducted from June 2022 to June 2023 in Dermatology, Venereology and Leprosy Department, KAHER's Dr. Prabhakar Kore hospital and MRC, Belgaum on participants with post-acne scars.

43 individuals completed the study. The study enrolled participants of both genders aged between 18 to 40 years, presenting with various types of atrophic acne scars. The findings were analysed using:

- Goodman and Baron's Qualitative Score[1]
- Goodman and Baron's Quantitative Score[2]
- Patient satisfaction through Visual Analog Scale
- Physician assessment using Physician's assessment grade

Objective evaluation of scar improvement was performed clinically and through photographic analysis, considering both grade improvements and subjective patient-reported enhancements.

Numerous modalities are implicated in the treatment of atrophic acne scarring, ranging from invasive surgical techniques to less invasive approaches.

Newer treatment options like MNRF and fractional-CO2 laser are more efficient in comparison to conventional modalities in providing quicker action, better effect, improved safety without systemic administration.

Our study differed significantly from other similar studies, with only a few findings aligning and many presenting contrary results.

In our study, there were 43 subjects between the age of 21-37 years with mean age group of the participants being 27.7 years. Whereas in a study by Reddy K Y et al, mean age group of the participants was 25.86 years.[81]

In research by Pall, Anuj et al, participants ages spanned from 19 years minimum to 49 years maximum with the average age of each subject 30.3 years.[73]On the contrary in another research by R.G. Sharada et al , the mean age of the population was 24.40 ± 3.01. [6]

In our study, women constituted the majority at 23 (53.5%), while men represented 20 (46.5%) of the total sample of our study. This was comparable with study by Pall, Anuj et al, [73]where of the 32 participants, 62.5% were women and 37.5% were men.

Our study contradicts the finding in study by R.G. Sharada et al,[6] where Males (72.5%) were more commonly affected than females (27.5%)

Among the total sample of 43 individuals, the majority, 26 (60.5%), displayed scars with a duration spanning between 6 to 10 years and 15 (34.9%) participants, exhibited scars that were up to 5 years old which was in concurrence with study by Reddy K Y et al where majority of the participants (46.66%) were between 5-10 years.[81]

Among 43 individuals, 41.9% of the sample were Fitzpatrick skin type III, and 39.5%, were Fitzpatrick skin type II. The remaining 18.6% belonged to skin type IV.

Rolling scars exhibited the highest prevalence, with 93.0% of observed cases falling into this category. Following closely behind were ice pick scars, with an 83.7% occurrence rate.

In our study, rolling scars and box scars exhibited superior results than ice-pick scars which was consistent with research performed by Chandrashekar BS et al. [82]

According to Goodman and Baron's Qualitative assessment scale [1]initially in our study, 51 % of the participants exhibited severe scarring on both sides, and 49 % moderate scarring on both sides.

After 3 sessions, on the right side, 37 % (16) had a reduction by 1 grade, 48 % (21) participants had a reduction by 2 grades, and 13 % (6) had a reduction by 3 grades.

On the left side, 30 % (13) showed reduction by 1 grade, 62% (27) had a reduction by 2 grades and 6 % (3) had reduction by 3 grades.

Likewise in research by Chandrashekar BS et al, 14 participants with Grade IV scars, 85.71% experienced a two-grade improvement, while 14.28% saw a one-grade improvement. Among 17 participants with Grade III scars, 76.47% experienced a two-grade improvement, with 23.52% seeing a one-grade improvement. For the 31 participants with Grade III and Grade IV acne scars, 80.64% experienced a two-grade improvement, while 19.35% saw a one-grade improvement.[82]

In a study by Reddy et al, 66 % had reduction by 2 grades, 13 % had reduction by 1 grade and 20 % had reduction by 3 grades which almost similar with our study.

In our study according to Goodman and Baron's quantitative analysis[2] at the end of one last session revealed that, very good reduction was seen in 20 %(9) participants, good reduction in 25 % (11) participants, Moderate reduction in 39% (17) participants, Minimal reduction was seen in 13% (6) participants.

According to Reddy K Y et al 20% (3) participants showed very good reduction, 26.7% (4) participants showed good reduction, 40% (6) participants showed moderate reduction and 13.3% (2) participants had minimal reduction which was in concordance with our study.[81]

In a research conducted by Chandrashekar BS et al, where 3% exhibited very good improvement, 9% demonstrated good improvement, 58% experienced moderate improvement, and 29% showed minimal improvement, these results paralleled those of our study.[82]

In another study by Reddy K Y et al, at the conclusion of the study, out of the 15 participants, 33.33% (5) participants were very satisfied with the treatment, 46.44% (7) participants were satisfied, and 20% (3) participants were slightly satisfied with the treatment. [81]

In a study by the M Ramesh, MG Gopal et al, out of 30 participants with acne scars, the cosmetic effect was excellent (>60% improvement) in 4 participants, good improvement (35–60% improvement) in 18 participants and moderate to poor improvement (<35% improvement) in 8. [83]

In our study, based on the visual analogue scale, on the right side, 41 % had very good improvement , 55 % had good improvement, and 2 % had moderate improvement. Whereas on the left side, 30 % had very good improvement , 65% had good improvement, and 4 % had moderate improvement.

In a study by Ibrahim et al. (2017), 90 participants with atrophic scars were split into three groups. Group I consisted of 28 participants who underwent microneedling every 4 weeks. Group II included 34 participants who received platelet-rich plasma injections every 2 weeks. Group III comprised 28 participants who underwent alternating sessions of microneedling and platelet-rich plasma every 2 weeks for up to six sessions. The study found a significant improvement in atrophic scar appearance across all groups, with Group III showing the most pronounced improvement due to the combined treatment of PRP and microneedling. [84]

In a study by Nandini AS et al, microneedling was shown to enhance all types of scars, regardless of the use of PRP. However, when microneedling was combined with PRP, there was a notably higher occurrence of excellent improvement, defined as a two-grade improvement.[85]

In a study by Diab NAF et al, the Global scarring grading system (GSGS) and patient satisfaction, the enhancement observed in the I-PRF group, whether administered alone or combined with needling, was notably superior to that of the PRP group. The severity of scarring, evaluated by GSGS, exhibited greater improvement in the I-PRF group compared to PRP. However, the contrast between the side treated solely with I- PRF and the side treated solely with PRP did not demonstrate statistical significance. [86]

At our study's conclusion, there was an observable change in scar grading. Grade II physician assessment score notably decreased in frequency, especially on the left side, with only 4.6% remaining, though this change did not reach statistical significance. Conversely, Grade III physician assessment score showed an increase by the study's end, with 34.9% and 60.5% observed on the right and left sides, respectively. This represented a statistically significant difference compared to the baseline.

Erythema was consistently observed in all participants, with a prevalence of 100% on the right cheek and 97.7% on the left cheek. Edema noted in a significant proportion of cases, with rates of 44.2% on the right side and notably higher at 67.4% on the left side.

However, in all cases, both redness and oedema disappeared within 2–3 days after the sessions. This agreed with the study by Diab NAF et al.[86]

In study by Reddy K Y et al, participants experienced oedema and erythema soon after the treatment like our study. [81]

Which was also in agreeing with Chandrashekar BS et al, where temporary side effects such as mild oedema, hyperpigmentation, and track marks from the devices were noted.[82]

Although, Ramesh et al. noted waning off effects at the site of treatment, including oedema, a burning sense lasting for one hour, and mild scaling and crusting.[83]

In our study, most participants reported burning sensations on the right side (67.4%), whereas a much lower proportion experienced this on the left side (11.6%), although this difference was not statistically significant.

The discrepancies between our study findings and those of others can be attributed to variations in several key factors, including the study duration, the specific type of machine utilized, and the intervals between treatment sessions. These differences may lead to distinct outcomes and interpretations across studies, highlighting the importance of considering contextual factors when comparing research finding.

CONCLUSION

Our research did the evaluation of efficacy and safety of MNRF followed by Intradermal injection of PRP on left side and I PRF on right side in the treating post acne scars.

- 43 participants were included in our research.
- Common age group affected with acne scars was 26-30
- Females were affected more than males and the gender difference was statistically significant.
- According to Goodman and Baron qualitative grade, 51 % participants exhibited severe scarring. The intervention led to visible changes in scar severity, but statistical analysis showed these changes were not significant, with p-values of 0.41 and 0.44 for the right and left sides, respectively.
- Goodman and Baron quantitative grade, baseline mean scores were 10.7 and 10.5 on the right and left sides, respectively. At the end, mean scores dropped notably to 6.6 on both sides, indicating improved scar severity. Statistical analysis confirmed these changes were significant ($p < 0.001$) for both sides.
- According to Visual Analogue scale, maximum participants noted 50-75% improvement (55.8% on right and 65.1% on left), over 75% improvement was noted in 41.9% on right and 30.2% on left, Statistical analysis showed significant differences before and after intervention ($p < 0.001$ for right and 0.03 for left).
- Most of the adverse effects were transient and subsided within 2-3 days. There was no pigmentation noted on either side.
- Despite not having statistically significant change in Goodman and Baron scoring system, Injectable platelet rich fibrin had better visual differences and longer filling effects.

- Given the unique nature of our study, which involve specific methodologies, patient populations, or treatment modalities not widely explored in existing literature, there was limited comparable research available to validate our findings
- Hence to conclude, I-PRF is an easy, secure, rapid, and economical technique employed in managing post acne atrophic scars.

There is still requirement for further controlled trials on PRF, either independently or in conjunction with different treatment methods. These trials are essential to substantiate PRF's capacity to replace PRP in managing various skin conditions.

SUMMARY

The present research looked for safety and efficacy of MNRF followed by Intradermal injection of PRP on left side and I PRF on right side in the treating post acne scars

43 participants finished the total duration of study, and belonged tothe age group of 18–40 years.

- Female preponderance was noted.
- Scar improvement was evaluated through :

  -Goodman and Baron's qualitative score

  -Goodman and Baron's quantitative score

  -Visual Analog Scale (VAS)

  -Physician assessment.

- According to Goodman and Baron's qualitative score at the baseline, a considerable number of subjects had severe scarring on both sides. After the intervention, there was a noticeable shift towards milder scarring, which was not statistically significant.
- The average Goodman and Baron's quantitative score was assessed at baseline and at the study's conclusion. While there was a statistically significant improvement in scars, the results remained consistent across both sides.
- After analysing the VAS score for patient satisfaction, most participants reported being very satisfied with both right and left sides. Satisfaction was slightly higher on the right side and was statistically significant.

- Initially, a significant portion of participants were on physician assessment scale Grade II improvement. After the intervention the assessment grade on the right side was high and was also statistically significant.
- Given the distinctiveness of our study, there was limited availability of comparable research to corroborate our findings. This scarcity underscores the novelty and importance of our study in contributing to the existing body of knowledge in this area
- While both PRP and fluid PRF have demonstrated efficacy in treating atrophic acne scars, fluid PRF presents certain advantages in terms of simplicity, speed, and cost-effectiveness.
- However, further research and direct comparative studies are required to fully explain the relative benefits and optimal use of each treatment modality in clinical practice.

STRENGTHS

- I-PRF, a novel treatment modality, was incorporated into our study as an emerging option for addressing acne scars.
- No prior studies have compared the efficacy of PRP and I-PRF in treating acne scars, making our study the first of its kind in this regard.
- Our assessment of acne scars involved a thorough evaluation using both qualitative and quantitative criteria of Goodman and Baron's scoring system.
- This comprehensive approach sets our study apart from others, as prior research typically does not employ such a detailed assessment method.

LIMITATIONS

Our study faces a few limitations that require attention.

- Firstly, the sample size employed in our research is relatively small. This raises concerns regarding the representativeness of our findings to the broader population. Increasing the sample size could enhance the robustness and generalizability of our results.
- Secondly, the follow-up period in our study is limited. This restricts our ability to observe any potential long-term effects or changes. Extending the follow-up period would allow for a more comprehensive understanding of the dynamics at play.
- Thirdly, the duration of our study is relatively short. This temporal constraint may have implications for capturing all relevant variations or trends pertaining to the phenomenon under study. Extending the study period could provide a more nuanced perspective on the subject matter.

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ANNEXURE I : CONSENT FORM FORMAT

KAHERs JNMC

BELAGAVI

INFORMED CONSENT FORM

TITLE : A SPLIT FACE COMPARITIVE INTERVENTIONAL STUDY TO EVALUATE EFFICACY OF MICRONEEDLING FOLLOWED BY PLATELET RICH PLASMA VS MICRONEEDLING FOLLOWED BY AUTOLOGOUS INJECTABLE PLATELET RICH FIBRIN IN POST ACNE SCARS

Objective: 1. To evaluate the safety and efficacy of combination of Microneedling radiofrequency followed by Platelet rich plasma on left side and Injectable Platelet rich fibrin on right side

Introduction:

Explanation of procedure: After screening, eligible study participants are chosen. Before starting treatment, a detailed history, clinical examination of patients will be done and Informed consent will be taken. Digital photographs of both sides of face will be taken using identical camera settings, Patients positioning and room lighting at baseline and at every sitting. Goodman and Baron scoring of acne scars will be done. Precautions before and after the procedure will be adviced to the patient. Topical anesthetic cream eutectic mixture of local anaesthetic will be applied 30–45 min before the procedure to anesthetize the area. PRP will be prepared under strict aseptic conditions by drawing 6-mL blood in one vial having 1.5-mL Anticoagulant Citrate Dextrose (ACD) in 8.5-mL BD Vacutainer (BD Company, Bangalore, India) glass blood collection tubes. ACD vials will be used to

inhibit platelet aggregation. It will then be centrifuged for 15 min at 3600 rotations per minute.

Under all aseptic precautions, 30 mL of whole venous blood is withdrawn from antecubital vein via scalp vein catheter and is collected into two 15 mL sterile conical bottom centrifuge plastic tubes. No anticoagulant is added to the tubes. The tubes are then immediately placed diametrically opposite to each other inside the centrifuge fitted with bucket-handle/swing-out handle type of rotor (RemiR4c model) , and centrifuged at 800 rpm for 4 minutes. The tubes are removed and the upper yellow-orange-colored liquid obtained is injectable PRF. The product (I-PRF) thus obtained is filled in insulin syringes and used. Patient will undergo Microneedling radiofrequency on both sides followed by PRP on left side and I PRF on right side. Patient will be given topical antibiotic cream application for 3 days post procedure and will be adviced to use sunscreen diligently. Process will be repeated every 4 weeks. At the end of 12 weeks digital photographs will be taken at same angle to compare with baseline photographs and re-grading of Goodman and Baron scoring will be done for comparision with the baseline score. Physician's assessment will be classified as excellent, good, and poor. The improvement will be rated as poor, good, and excellent depending on the change in grade of acne scars by both treating physician and the patient. Patients' perceptions of improvement will be noted by using the visual analogue scale, where the patient was asked to mark on the line the point that they feel represents their perception of their current state.

Withdrawal from participation in the study: Participation in this study is voluntary. You will be free to decide whether to participate in this study or continue participation once enrolled. In case you decide to withdraw your participation, you are free to do so. However, please convey the decision to the principal investigator.

Possible benefits from participating in the study: You will/will not have nor get any benefits by participating in this study. The data gathered will help the population at large.

Possible risks from participating in the study: There are no risks involved in participating in this study.

Privacy and confidentiality: The information collected from you will be coded, to prevent any person from identifying you. Your identity will never be revealed. The data collected from you will be kept confidential and only processed or aggregated data will be used for publication.

Financial incentives: You will not receive any payment for participating in this study.

Authorization for publication of aggregated data: Results obtained after processing of the aggregated data will be published for scientific purposes and or presented to scientific groups. However, your identity will never be revealed.

Questions: If you have any question or complaints regarding your right as study participant you may contact Dr Harsha Hegde, Chairperson, Ethical committee of JNMC, 0831-2473777 Extension 4052.

Legal rights: By signing this consent form, we are not waving any of your legal rights.

ANNEXURE II: PROFORMA

TITLE : A SPLIT FACE COMPARITIVE INTERVENTIONAL STUDY TO EVALUATE EFFICACY OF MICRONEEDLING RADIOFREQUENCY FOLLOWED BY

PLATELET RICH PLASMA VS MICRONEEDLING RADIOFREQUENCY FOLLOWED BY AUTOLOGOUS INJECTABLE PLATELET RICH FIBRIN IN POST ACNE SCARS

	DEMOGRAPHIC DETAILS	
NAME		
GROUP	A	B
AGE		
SEX	MALE	FEMALE
OCCUPATION	EMPLOYED	UNEMPLOYED
DATE		
ADDRESS		

DURATION	MONTHS	YEARS
EXPOSURE TO SUNLIGHT	PRESENT	ABSENT
USE OF SUNSCREEN	PRESENT	ABSENT

USE OF COSMETICS	PRESENT		ABSENT
FITZPATRICK SKIN TYPE	II III	IV	V
TYPE OF SCAR	ROLLING	ICEPICK	BOXCAR
TREATMENT FOR ACNE	PRESENT	ABSENT	
SYSTEMIC			
TOPICAL			
LASER			
PAST HISTORY	PRESENT	ABSENT	
APPLICATION OF STEROIDS			
HYPERTENSION			
PCOS			

GOODMAN AND BARON'S SCALE

RIGHT SIDE (MNRF+ I PRF)

GRADE	BEFORE	AFTER
QUALITATIVE GRADE		
QUANTITATIVE GRADE		

LEFT SIDE (MNRF + PRP)

GRADE	BEFORE	AFTER
QUALITATIVE GRADE		
QUANTITATIVE GRADE		

VISUAL ANALOG SCALE (PATIENT SATISFACTION)

SCORE	RIGHT SIDE	LEFT SIDE
BEFORE		
AFTER		

0-NOT SATISFIED

1-SLIGHTLY SATISFIED

2-VERY SATISFIED

3-EXTREMELY SATISFIED

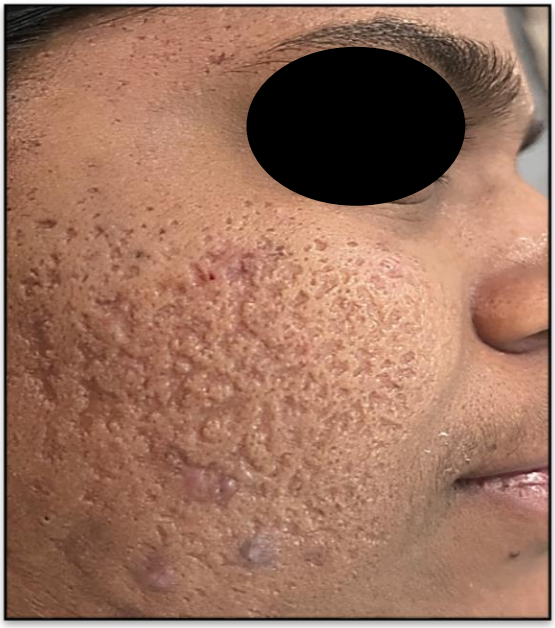
PHYSICIAN'S ASSESSMENT GRADING

GRADE	RIGHT SIDE	LEFT SIDE
1st sitting		
3rd sitting		

GRADE	%improvement after 3 sessions
1	0-25
2	26-50
3	51-75
4	76-100

SIDE EFFECTS : Erythema, edema, burning sensation, scabbing, pigmentation

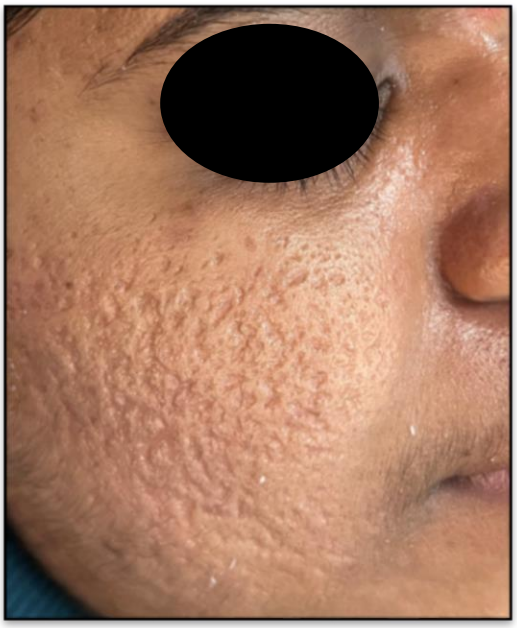
BEFORE (RIGHT SIDE-I PRF)



GOODMAN AND BARON GRADE IV

Photograph 1 (a)

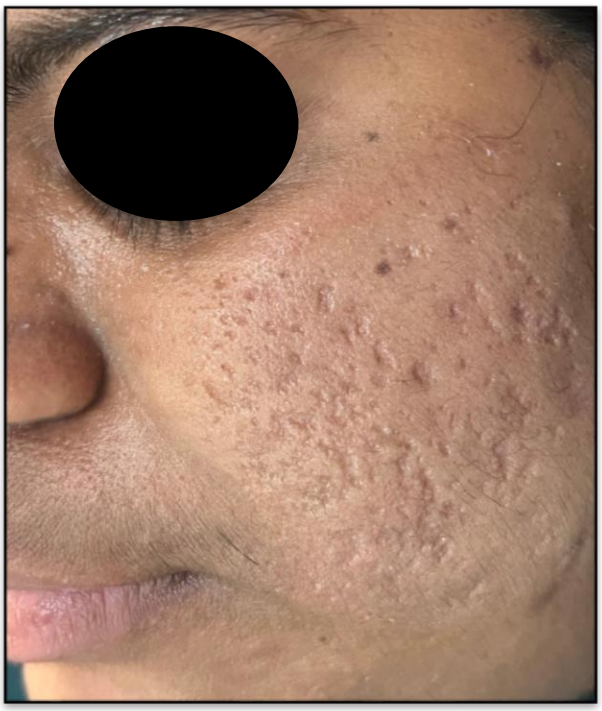
AFTER AT 12 WEEKS (RIGHT SIDE-I PRF)



GOODMAN AND BARON GRADE II

Photograph 1 (b)

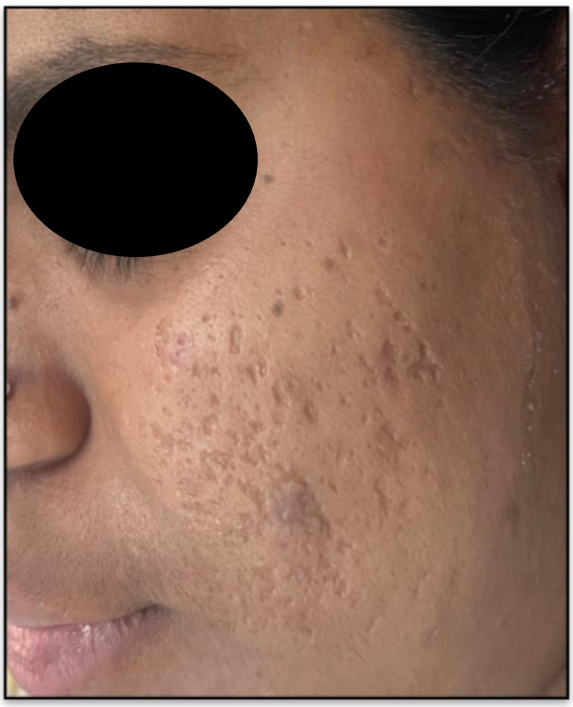
BEFORE (LEFT SIDE PRP)



GOODMAN AND BARON GRADE:III

Photograph 1(c)

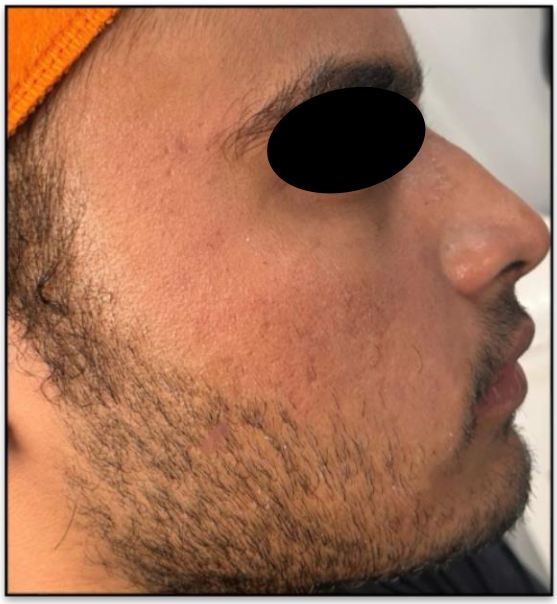
AFTER AT 12 WEEKS (LEFT SIDE- PRP)



GOODMAN AND BARON GRADE;II

Photograph 1(d)

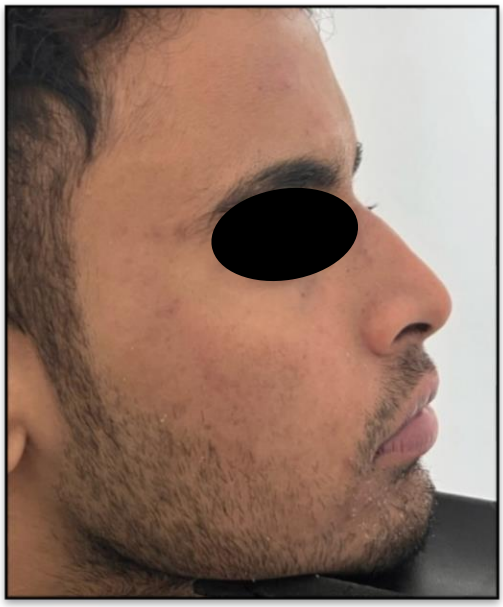
BEFORE (RIGHT SIDE-I PRF)



GOODMAN AND BARON GRADE III

Photograph 2(a)

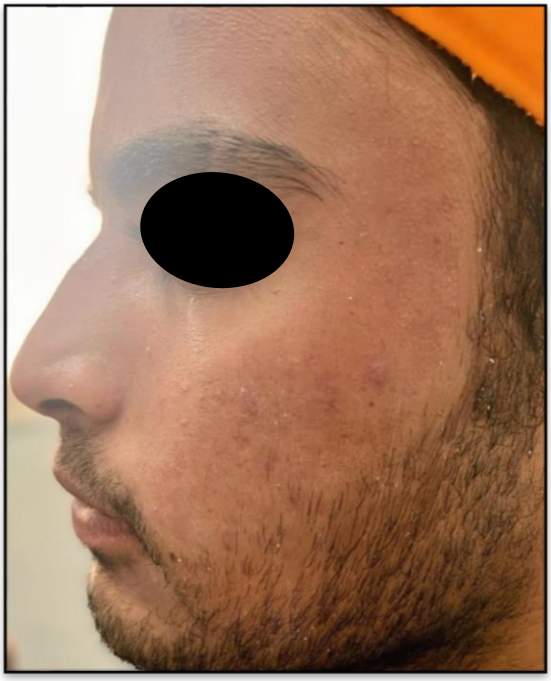
AFTER AT 12 WEEKS (RIGHT SIDE-I PRF)



GOODMAN AND BARON GRADE II

Photograph 2 (b)

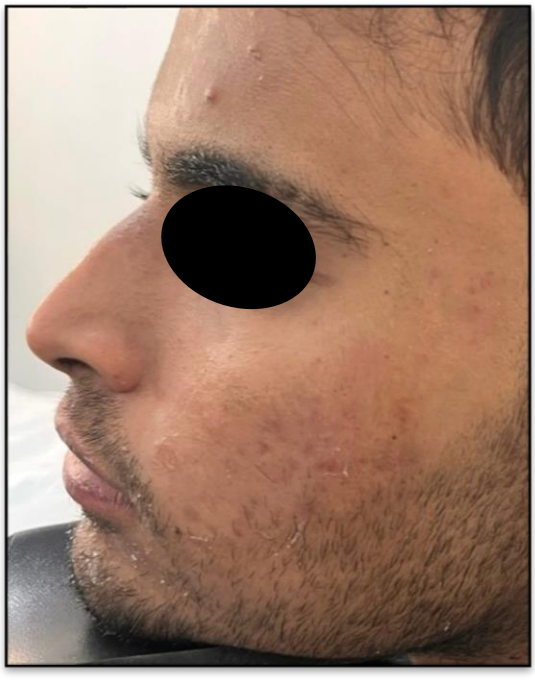
BEFORE (LEFT SIDE PRP)



GOODMAN AND BARON GRADE II

Photograph 2(c)

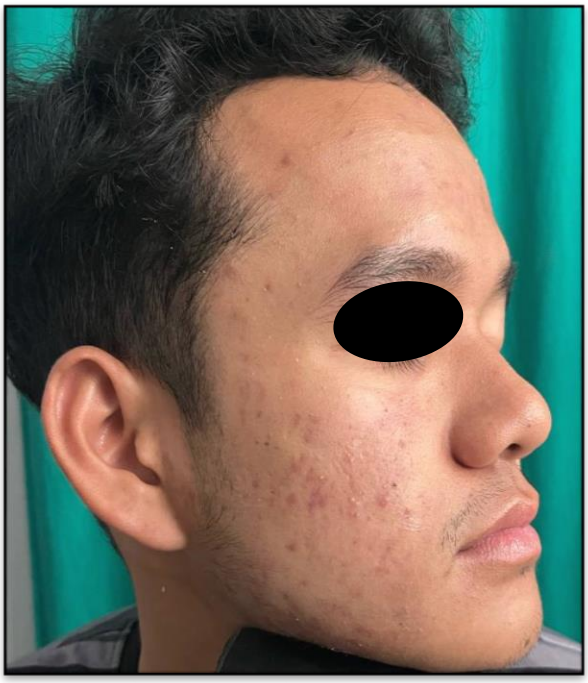
AFTER AT 12 WEEKS (LEFT SIDE-PRP)



GOODMAN AND BARON GRADE 1

Photograph 2 (d)

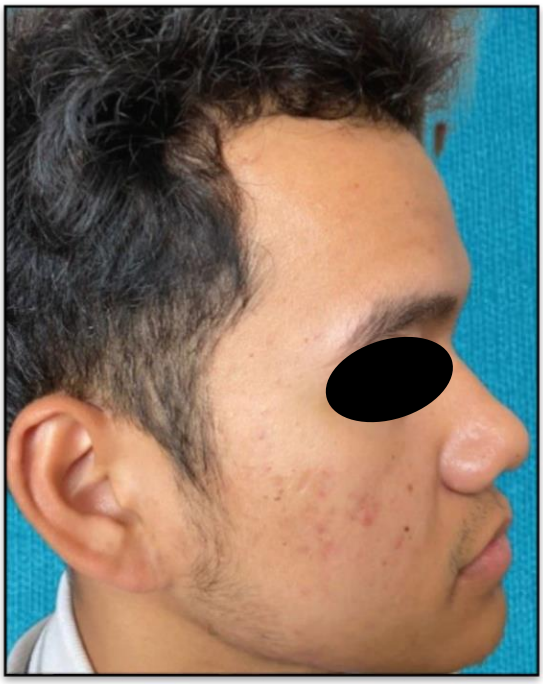
BEFORE (RIGHT SIDE-I PRF)



GOODMAN AND BARON GRADE III

Photograph 3 (a)

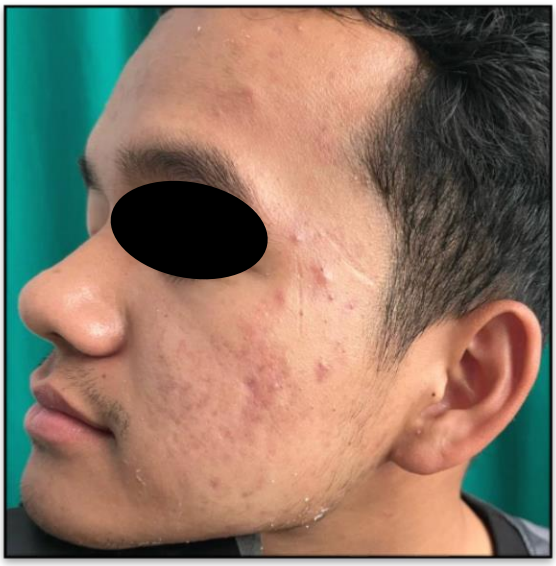
AFTER : 12 WEEKS (RIGHT SIDE-I PRF)



GOODMAN AND BARON GRADE 1

Photograph 3 (b)

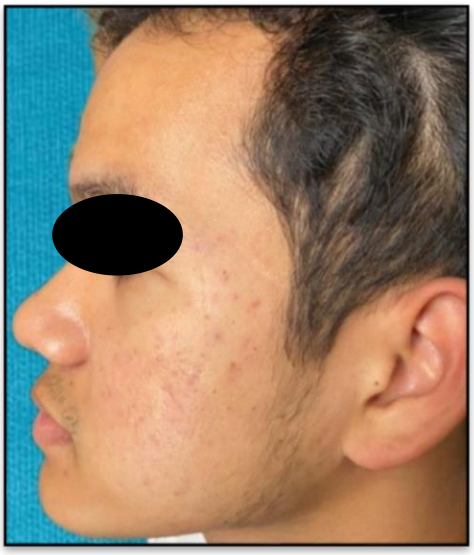
BEFORE (LEFT SIDE PRP)



GOODMAN AND BARON GRADE III

Photograph 3 (c)

AFTER AT 12 WEEKS (LEFT SIDE-PRP)



GOODMAN AND BARON GRADE 1

Photograph 3 (d)

ANNEXURE IV : KEY TO MASTER CHART

GOODMAN AND BARON QUANTITATIVE SCALE

	Grade (type)	No of lesions		
		1-10	11-20	>20
A	Milder scarring-Macular erythematous, pigmented, mildly atrophic dish like	1 pts	2 pts	3 pts
B	Moderate scarring-moderately atrophic dish like, punched out small scars with, shallow bases but atrophic areas (<5mm)	2 pts	4 pts	6 pts
C	Severe scarring-punched out with deep but normal bases, punched out with deep abnormal bases, linear or troughed dermal scarring, deep and broad atrophic areas	3 pts	6 pts	9 pts
D	Hyperplastic popular scars	2 pts	4 pts	6 pts
E	Hyperplastic keloidal or hypertrophic scars	Area < 5 cm^2 -6 points	Area 5-20 cm^2 -12 points	Area> 20 cm^2 -18 points

GOODMAN AND BARON QUALITATIVE SCALE:

Grade	Level of disease	Clinical features
1	Macular	These scars can be erythematous,hyper- or hypopigmented flat marks. They do not represent a problem of contour like other scar grades but of colour
2	Mild	Mild atrophy or hypertrophic scars that may not be obvious at social distances of 50 cm or greater and maybe covered adequately by makeup or the normal shadow of shaved beard hair in men or normal body hair if extra facial
3	Moderate	Moderate atrophic or hypertrophic scarring that is obvious at social distances of 50cm or greater and is not covered easily by makeup or the normal shadow of shaved beard hair in men or body hair if extrafacial,but is still able to be flattened by manual stretching of the skin
4	Severe	Severe atrophic or hypertrophic scarring that is evident at social distances greater than 50cm and is not covered easily by makeup or the normal shadow of shaved beard hair in men or body hair if extrafacial and is not able to be flattened by manual stretching of the skin

VISUAL ANALOGUE SCALE:

POINT 1	< 25 % improvement
POINT 2	25-50% improvement
POINT 3	50-75% improvement
POINT 4	>75% improvement

PHYSICIAN ASSESSMENT GRADE:

GRADE 1	0-25% improvement
GRADE 2	26-50% improvement
GRADE 3	51-75 % improvement
GRADE 4	76-100 % improvement

NAME	AGE	SEX	OCCUPATION	DURATION	SUNLIGHT EXPOSURE	USE OF SUNSCREEN	USE OF COSMETICS	FITZPATRICK SKIN TYPE	SITE OF SCARS					TYPE OF SCARS			TREATMENT	FAMILY HISTORY OF	GOODMAN AND BARON SCORE								VISUAL ANALOGUE SCALE				PHYSICIAN ASSESSMENT				ADVERSE EFFECTS											
																			QUALITATIVE				QUANTITATIVE												RIGHT						LEFT				
																			RIGHT		LEFT		RIGHT		LEFT		RIGHT		LEFT		RIGHT		LEFT		ERYTHEMA	EDEMA	PIGMENTATION	BURNING	SCABBING		ERYTHEMA	EDEMA	PIGMENTATION	BURNING	SCABBING
									FRONTAL	TEMPORAL	CHEEK	NOSE	CHIN	ROLLING	BOXCAR	ICEPICK			BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER											
ASHWINI	28	F	U	10	YES	NO	YES	III	NO	YES	YES	NO	YES	YES	YES	NO	NO	NO	4	3	4	3	14	10	13	9	2	4	2	3	2	3	2	3	YES	YES	NO	YES	YES		YES	YES	NO	NO	YES
SADIQ	29	M	E	5	YES	NO	NO	III	YES	YES	YES	NO	NO	YES	NO	YES	YES	NO	3	2	4	2	9	6	11	8	1	3	1	3	1	3	3	4	YES	NO	YES	YES	YES		YES	NO	NO	NO	YES
VIJAYALAKSHMI	36	F	E	9	NO	YES	YES	II	NO	NO	YES	NO	NO	NO	NO	YES	YES	NO	3	1	4	2	8	4	9	5	2	4	1	3	2	4	3	4	YES	YES	NO	YES	YES		YES	YES	YES	NO	YES
RAHUL	26	M	E	5	YES	NO	NO	IV	YES	YES	YES	NO	NO	YES	YES	YES	NO	YES	4	2	3	1	10	6	12	7	2	3	1	2	2	4	1	3	YES	YES	NO	YES	YES		YES	YES	NO	NO	YES
ABDUL	35	M	E	11	YES	NO	NO	IV	YES	YES	YES	YES	YES	YES	YES	NO	NO	YES	4	2	4	1	14	9	13	7	1	3	1	3	1	3	1	2	YES	YES	NO	YES	YES		YES	YES	NO	NO	YES
TRUPTI	32	F	U	6	NO	YES	YES	II	NO	YES	YES	NO	NO	YES	NO	YES	YES	YES	3	1	3	2	9	4	10	4	1	3	1	3	2	4	2	3	YES	NO	YES	YES	YES		YES	YES	NO	NO	YES
VINAYAK	24	M	U	6	YES	NO	NO	III	NO	YES	YES	NO	NO	YES	YES	YES	NO	YES	4	2	3	2	11	6	9	4	1	3	2	4	2	4	2	4	YES	YES	NO	YES	YES		YES	NO	NO	NO	YES
VIGNATHA	27	F	E	7	NO	YES	YES	II	NO	NO	YES	NO	NO	YES	NO	YES	NO	NO	4	2	4	3	9	6	10	8	2	4	2	3	2	4	1	3	YES	YES	NO	NO	NO		YES	YES	YES	NO	NO
SHILPA	24	F	U	4	YES	NO	YES	III	YES	NO	YES	NO	NO	YES	NO	YES	NO	NO	3	2	3	3	11	8	8	6	2	4	2	4	2	4	2	3	YES	YES	NO	NO	YES		YES	YES	YES	NO	YES
MAHADEV	28	M	E	8	YES	NO	NO	IV	YES	YES	YES	NO	YES	YES	YES	YES	NO	YES	3	2	3	2	8	6	12	8	2	4	2	3	2	4	1	3	YES	YES	YES	YES	YES		YES	YES	YES	NO	YES
SIDDIQ	26	M	E	6	YES	YES	NO	III	NO	YES	YES	NO	NO	YES	YES	YES	NO	NO	4	2	4	2	12	8	13	9	1	3	1	3	1	4	3	4	YES	NO	YES	YES	YES		YES	YES	NO	NO	YES
SAMITA	22	F	U	7	YES	YES	YES	II	NO	YES	YES	NO	NO	YES	NO	YES	NO	NO	4	3	4	2	9	7	11	7	1	3	2	4	1	4	2	3	YES	YES	NO	YES	YES		YES	NO	NO	NO	YES
MINAL	26	F	U	4	YES	YES	YES	II	NO	YES	YES	NO	NO	YES	NO	YES	YES	NO	3	2	3	1	10	7	8	6	1	3	1	3	2	3	1	3	YES	YES	NO	YES	YES		YES	YES	YES	NO	YES
NEHA	22	F	U	3	YES	NO	YES	III	YES	NO	YES	NO	NO	YES	NO	YES	YES	NO	3	2	3	2	12	8	11	7	1	3	2	3	1	4	1	2	YES	NO	NO	YES	NO		YES	YES	NO	NO	YES
RAMYA	24	F	U	4	YES	YES	YES	II	YES	YES	YES	NO	NO	YES	YES	YES	NO	NO	4	3	4	3	14	9	13	10	2	3	1	3	2	4	2	3	YES	YES	NO	YES	NO		YES	YES	YES	NO	YES
POOJA	25	F	U	6	YES	YES	YES	IV	NO	YES	YES	YES	YES	YES	YES	YES	NO	YES	4	4	3	2	9	7	6	5	2	3	2	3	1	4	2	4	YES	YES	YES	NO	NO		YES	NO	NO	NO	YES
SAHITHI	26	F	E	6	YES	YES	YES	II	NO	YES	YES	NO	NO	YES	NO	YES	NO	NO	3	1	3	1	9	4	8	4	1	3	2	3	2	4	3	4	YES	YES	NO	NO	YES		YES	NO	NO	NO	YES
SHAMEEK	30	M	E	8	YES	NO	NO	IV	YES	YES	YES	YES	NO	YES	YES	YES	NO	YES	4	2	4	3	14	10	13	9	2	4	2	3	2	3	1	3	YES	YES	NO	YES	YES		YES	YES	NO	NO	YES
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PRAGNYA	28	F	E	7	YES	YES	YES	II	YES	NO	YES	NO	NO	YES	YES	YES	NO	NO	4	2	3	2	9	7	10	7	2	3	1	3	1	4	2	4	YES	NO	YES	YES	YES		YES	YES	YES	NO	YES
SAMARTH	24	M	U	5	YES	NO	NO	II	YES	YES	YES	YES	NO	YES	YES	YES	NO	NO	4	2	4	2	11	9	12	7	2	4	2	4	1	4	1	3	YES	NO	YES	YES	YES		YES	YES	YES	NO	YES
SHRUSTI	22	F	U	4	YES	YES	YES	II	YES	NO	YES	NO	NO	YES	YES	YES	NO	NO	3	2	4	3	12	9	11	6	2	4	2	3	2	4	3	4	YES	NO	NO	YES	YES		YES	YES	YES	NO	YES
SUSHMITHA	26	F	U	7	YES	YES	YES	II	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES	4	2	3	1	11	7	7	4	2	3	1	3	1	4	1	3	YES	NO	NO	YES	NO		YES	YES	YES	NO	YES
BHAGYASHREE	37	f	U	11	YES	YES	YES	III	NO	YES	YES	NO	NO	YES	YES	NO	NO	NO	3	1	3	2	10	6	9	7	1	4	1	3	2	3	2	3	YES	NO	NO	YES	NO		YES	NO	NO	NO	YES
PRAKASH	28	M	E	7	YES	YES	YES	III	NO	YES	YES	NO	NO	YES	YES	YES	YES	NO	3	2	4	1	9	7	9	7	1	3	1	2	2	3	1	3	YES	NO	YES	YES	YES		YES	NO	NO	NO	YES
ALOK	26	M	E	6	YES	YES	YES	II	YES	YES	YES	NO	NO	YES	YES	YES	YES	NO	4	2	3	2	9	5	11	6	2	4	2	3	1	4	3	4	YES	YES	YES	NO	YES		YES	NO	NO	NO	YES
PRAGATI	24	F	U	4	YES	YES	YES	III	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	3	1	4	2	8	5	9	7	1	3	2	3	2	4	3	4	YES	YES	YES	NO	YES		YES	YES	YES	NO	YES
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SHOAIB	36	M	E	7	YES	YES	YES	III	YES	YES	YES	NO	NO	YES	YES	NO	YES	NO	3	1	4	2	12	8	11	9	2	4	1	3	1	4	2	3	YES	NO	YES	YES	NO		YES	NO	YES	NO	YES
SOMESH	30	M	E	9	YES	YES	YES	IV	YES	YES	YES	YES	YES	NO	YES	NO	YES	NO	3	1	3	1	12	7	13	8	1	4	2	4	2	3	1	3	YES	NO	YES	YES	YES		YES	YES	YES	NO	YES
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FATIMA	23	F	U	5	YES	YES	YES	II	YES	YES	YES	NO	YES	YES	YES	YES	NO	NO	3	2	4	2	8	5	11	5	2	4	1	4	1	4	2	3	YES	YES	NO	YES	YES		YES	NO	YES	NO	YES
ILIYAZ	27	M	E	6	YES	NO	NO	III	YES	YES	YES	YES	NO	YES	YES	YES	NO	YES	3	2	4	2	12	6	9	5	1	2	2	3	2	3	2	4	YES	NO	YES	YES	YES		YES	NO	NO	YES	YES
IRAYYA	28	M	E	4	YES	NO	NO	IV	NO	YES	YES	YES	NO	YES	YES	YES	YES	YES	4	1	4	2	10	6	13	6	1	3	1	4	1	4	2	4	YES	NO	NO	NO	NO		YES	NO	NO	YES	YES
VINAYAK	26	M	E	3	YES	NO	NO	IV	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	4	2	3	2	13	6	12	6	1	3	2	3	1	3	1	3	YES	NO	NO	YES	NO		YES	YES	NO	YES	NO
SOMESH	32	M	E	6	YES	NO	NO	III	NO	YES	YES	NO	NO	YES	NO	YES	NO	NO	3	1	4	2	11	6	14	7	2	4	1	3	2	4	2	4	YES	NO	YES	NO	YES		YES	YES	NO	NO	NO
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SUNIL	34	M	E	8	YES	NO	NO	III	YES	YES	YES	YES	NO	YES	YES	YES	YES	NO	3	2	4	2	14	6	9	5	1	3	2	4	1	3	2	3	YES	NO	NO	YES	YES		YES	NO	NO	YES	NO
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TAHREEN	27	F	E	9	YES	YES	YES	III	NO	YES	YES	NO	YES	YES	YES	YES	NO	YES	3	2	4	1	12	6	8	5	1	3	2	4	1	3	2	4	YES	NO	NO	NO	YES		NO	NO	YES	NO	NO