

RESEARCH ARTICLE

Effect of cephalosporin injection postoperative after cell assisted lipografting in fat survival and improving post burn scar quality

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ABSTRACT

Scars have always been an issue, and the majority of treatments have failed to address them adequately. The biggest obstacle that plastic surgeons still face is finding an effective procedure that works for all skin types in the long run. In a non-invasive way, external volume expansion (EVE) devices use suction to mechanically stretch and stimulate tissues. Different studies have proposed various mechanisms for how stretch releases the skin, including mechanical action on individual cells, inflammation, ischemia, and soluble mediators that promote cell proliferation, adipogenesis, and most crucially, vascular remodeling. Platelet-rich plasma (PRP) is a product made from autologous blood that is concentrated in plasma volume and contains an abundance of platelets, growth factors, and chemo/cytokines. The contents of the alpha and dense granules in PRP have the ability to provide a high concentration of growth factors to the tissues that need them. Autologous fat grafting, initially described by Neuber in 1893 and subsequently improved by Coleman, is a relatively new alternative to scar tissue removal. It is believed that autologous fat grafting improves skin quality by increasing dermal thickness and volume via stimulating the neosynthesis of collagen fibers. It is still unclear what impact autologous fat grafting has on scar tissue, despite its growing popularity in the medical field, and the use of postoperative cephalosporin is very essential for guarding against infection and losing of fat. Critics have cast doubt on its usefulness due to the fact that survival rates can range from 30% to 80% , the infection rate and loss of fat

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INTRODUCTION

The epidermis, dermis, hypodermis, and skin appendages make up the intricate skin tissue. Processes Blood clotting, inflammation, proliferation (epithelialization, fibroplasia, angiogenesis, and granulation tissue formation), and maturation (collagen deposit or scarring tissue formation) are the four classical phases that typically overlap in the systematic process of skin wound healing (1). The severity and size of the burnt area, the patient's overall health, the type of skin graft used to cover the burnt area, and other factors all have a role in how quickly the skin recovers following a burn. The effects of the healing process on burns might vary in intensity. Wound and burn healing products often include fibroblasts and keratinocytes, two types of common cells. Keratinocytes create a great number of tight intercellular connections and are the main cells that make up the epidermis, which is stratified. The primary dermal cell type, fibroblasts, are responsible for producing

extracellular matrix components and secreting growth factors, cytokines, and matrix metalloproteinases. These substances guarantee the creation of extracellular matrix and the proliferation and differentiation of keratinocytes (2). Because of many desirable characteristics, including a high proliferation rate, ease of access, and the ability to retain their potency and differentiation potential for extended periods of time, epidermal stem cells (ESC) have garnered a lot of attention as a possible treatment for skin tissue regeneration.

Pathophysiology of wound healing and post inflammatory scar

There are three separate steps in postnatal tissue wound healing—inflammation, proliferation, and remodeling—that lead to the development of a scar. Excessive fibrosis or scar-free wound healing can be achieved by regulating each of the three stages. Pathological scars develop when the acute inflammatory

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phase lasts too long or wound healing takes too long, despite the fact that a flatter, less fibrotic scar is ideal (panel).

Hypertrophic scar

Typically seen in cases of serious skin trauma or burns, this fibro-proliferative condition of wound healing in the skin causes myofibroblasts to become active and deposit collagen. A critical step in the process of scar formation is the trans-differentiation of fibroblasts to myofibroblasts. This process involves α -SMA+ fibroblasts, which can stimulate the production of collagen, especially Col1 and Col3. However, it also leads to functional impairment and aesthetic destruction, as well as physiological and psychological issues. Investigation of the new clinical schedules is, hence, required.

External Volume Expansion

For more than a decade, patients have been able to experience mild, long-lasting enhancement with the use of the Brava device, an external soft-tissue expander. However, when used for a short period of time, Brava produces a dramatic temporary enlargement of the breasts and a massive fibrovascular scaffold, making it an excellent candidate for fat grafts. Similar to how pregrafting expansion makes the recipient matrix bigger and more fertile, Brava helps spread out fat graft droplets while each one keeps the vital graft-to-recipient interface contact needed for revascularization. Wearing the device before the treatment causes the recipient matrix to pre-expand, creating more space between the tissue planes, less interstitial pressure in the scar, and more parenchymal space, all for a fixed amount of fat injected. In the absence of pre-expansion, the fat serves as both an internal tissue expander and a graft that requires nutrition for survival (3).

Stem Cells survival after injection of cephalosporin

When it comes to treating scarring, fibrosis, and wound contraction, stem cell-based wound healing therapies are a new and exciting method. In the aftermath of an injury, stem cells play a pivotal role in the phases of wound healing. During the first inflammatory phase, endogenous stem cells travel to the injured area, where they trigger immunomodulation effects, which speed up the healing process, create new blood vessels, and reepithelialize the wound (4). Treatment of scars, wound contraction, and the pathophysiology of scar formation have all been areas of intense research into mesenchymal stem cells (MSCs) and adipose derived stem cells (ADSCs). Multipotent stem cells (MSCs) are cells with the ability to self-renew and



Figure 1



Figure 2



Figure 3

differentiate into several types of mesenchymal cells. Because of its ability to repair the hypodermis, dermis, and epidermis, ADSCs have gained a lot of interest in skin regeneration (7). Using ADSCs in conjunction with fat grafting improved wound angiogenesis, reduced inflammation, and increased scar size and quality in both animal and human investigations (8).

Aim of the Study

This study aimed to evaluate Effect of cephalosporin injection postoperative after cell assisted lipografting in fat survival and improving post burn scar quality

There were 2 groups

Group A: This group included 15 patients who were injected by cephalosporin after fat, PRP and adipose derived stem cells injection in scarred tissue

Group B: This group included 15 patients who were NOT injected by cephalosporin after fat, PRP and adipose derived stem cells injection

- A Punch biopsy was taken prior to external volume expansion and/or injection of fat for each case. Fig (8)

- Another biopsy was taken 10 weeks after completion of the procedure for each case (external volume expansion then injection of fat, PRP and adipose derived stem cells injection for group A VS injection of fat , PRP and adipose derived stem cells only with no prior volume expansion for group B).This second punch biopsy was thoroughly evaluated (using haematoxylin and eosin “H&E”)
- Lastly evaluation was performed by rating each scar using the Vancouver scare scale (VCC) and fat size (with or without signs of infection).

RESULTS

Data will be collected according to:

- Vancouver Scar Scale
- Signs of infection

DISCUSSION

In a similar previous study, Cervelli et al. (2021) treated 60 patients affected had traumatic scars involving different body parts. Mean age was 38 ± 16 years, 30(50%) were male and 30(50%) were female, mean Body mass index (BMI) was 23.7 ± 2.2 kg/m². All patients were randomly allocated to one of three groups (20 patients per group) and underwent one of three different procedures. Group A was treated with fat grafts mixed with PRP, group B was treated with non-ablative laser, and group C was treated with both procedures. The author wanted to stimulate healing and so shorten the time taken for wound healing and tissue repair with large sample size than our study (60 v.s 30) patients. They implanted grafts of fat mixed with PRP under the scar tissue, and began the first pass of laser resurfacing after 1 week. Postoperative follow-up examinations were performed at weeks 1, 2, 4 and 8, and months 3 and 6.

In the current thesis (Chin et al., 2016), our findings can be explained by different theories. Firstly, external volume expansion prepares recipient sites to improve outcomes of fat grafting, results with external volume expansion vary. External volume expansion temporarily reduces perfusion, likely because of transient ischemia or edema. Together with mechano-transduction, these effects encourage a proangiogenic and proliferative environment in fibrotic tissue after treatment. Secondly, the use of autologous platelet-derived growth factors, contained in PRP, may represent a valid regenerative strategy

for their capacity to promote cell proliferation, differentiation, and neo-angiogenesis, favoring, in vivo, by Gentile et al. (2020).

CONCLUSION

We found that there was a statistically significant difference in group (A) after cephalosporin injection postoperative after cell assisted lipografting than in group (B) without injection of cephalosporin in improving post burn scar quality

REFERENCES

1. Shpichka A, Butnaru D, Bezrukov EA, Sukhanov RB, Atala A, Burdukovskii V, Zhang Y, Timashev P. Skin tissue regeneration for burn injury. *Stem cell research & therapy*. 2019 Dec;10:1-6.
2. Bhardwaj N, Chouhan D, Mandal B. Tissue engineered skin and wound healing: current strategies and future directions. *Current pharmaceutical design*. 2017 Jul 1;23(24):3455-82.
3. Jo H, Brito S, Kwak BM, Park S, Lee MG, Bin BH. Applications of mesenchymal stem cells in skin regeneration and rejuvenation. *International journal of molecular sciences*. 2021 Feb 27;22(5):2410.
4. Xu Z, Chen D, Hu Y, Jiang K, Huang H, Du Y, Wu W, Wang J, Sui J, Wang W, Zhang L. Anatomically distinct fibroblast subsets determine skin autoimmune patterns. *Nature*. 2022 Jan 6;601(7891):118-24.
5. Li Y, Zhang J, Shi J, Liu K, Wang X, Jia Y, He T, Shen K, Wang Y, Liu J, Zhang W. Exosomes derived from human adipose mesenchymal stem cells attenuate hypertrophic scar fibrosis by miR-192-5p/IL-17RA/Smad axis. *Stem Cell Research & Therapy*. 2021 Dec;12:1-6.
6. Shpichka A, Butnaru D, Bezrukov EA, Sukhanov RB, Atala A, Burdukovskii V, Zhang Y, Timashev P. Skin tissue regeneration for burn injury. *Stem cell research & therapy*. 2019 Dec;10:1-6.
7. Finnerty CC, Jeschke MG, Branski LK, Barret JP, Dziewulski P, Herndon DN. Hypertrophic scarring: the greatest unmet challenge after burn injury. *The Lancet*. 2016 Oct 1;388(10052):1427-36.
8. Kanji S, Das H. Advances of stem cell therapeutics in cutaneous wound healing and regeneration. *Mediators of inflammation*. 2017;2017(1):5217967.
9. Tenna S, Cogliandro A, Barone M, Panasiti V, Tirindelli M, Nobile C, Persichetti P. Comparative study using autologous fat grafts plus platelet-rich plasma with or without fractional CO₂ laser resurfacing in treatment of acne scars: Analysis of outcomes and satisfaction with FACE-Q. *Aesthetic plastic surgery*. 2017 Jun;41:661-6.