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ULTRASOUND-GUIDED GLUTEAL AUGMENTATION WITH HIGH MOLECULAR WEIGHT HYALURONIC ACID GUIDED BY ULTRASOUND

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Abstract
In the continuous advancement of non-surgical aesthetic options, ultrasound-guided buttock augmentation with high molecular weight hyaluronic acid (HA) emerges as an innovative and personalized procedure. The aim of this research was to analyze the ultrasound-guided technique for buttock augmentation with high molecular weight hyaluronic acid, providing a comprehensive view of the technique, from practical application to results and considerations. A series of clinical cases were employed involving patients undergoing this procedure. As a result, all six patients reported a high level of satisfaction. The successful application of HA in patients of various ages emphasizes its versatility and ability to achieve satisfactory non-surgical results. It is concluded that the benefits of buttock augmentation with dermal fillers, including the non-surgical nature and reversibility of results, reflect a preference for minimally invasive interventions. This study provides a comprehensive foundation for informed decisions in non-surgical aesthetic procedures, highlighting the relevance of the proper combination of HA chemical factors in the durability of results.

Keywords: Hyaluronic acid, Buttock augmentation, Ultrasound, Dermal fillers, Aesthetic safety, Molecular weight.

Introduction
The search for safe and effective alternatives to traditional surgeries has driven the development and adoption of non-invasive and less risky techniques in the field of plastic and aesthetic surgery (1). One of the methodologies that has emerged as a promising option is ultrasound-guided buttock augmentation with high molecular weight hyaluronic acid. This approach combines the versatility of hyaluronic acid with the precision of ultrasound to achieve satisfying, natural results in patients looking to improve the shape and volume of their buttocks.

Dovedytis, et al (2), state that, during the year 2019, a 1% increase in the application of hyaluronic acid fillers was observed compared to the previous year, 2018, this constant increase underlines the growing popularity of these procedures. An interesting fact provided by the American Society of Plastic Surgeons (ASPS) is the trend in the Latino population in the United States, where both women and men are increasingly resorting to these procedures (3).

In Latin America, the situation is similar, as hyaluronic acid injections have become one of the most requested procedures for aesthetic interventions (1,2). It is important to note that the approved indications for the use of hyaluronic acid have increased since its initial approval, so new brands have been introduced to the market, some layering techniques have been adjusted, and in general, the amount of product administered has increased (4). Despite these changes, hyaluronic acid processes continue to show a robust safety profile and a low incidence of adverse events (4).

According to Chandra et al (5), hyaluronic acid (HA) is produced by the enzyme hyaluronate synthase (HAS), which has three isoenzymes (HAS-1, HAS-2 and HAS-3) in vertebrates. These three isoenzymes produce hyaluronic acid polymers of different sizes and are differentially regulated by transcriptional, translational, and post-translational levels, including alternative splicing, subcellular localization, and epigenetic processes. Each of the three isoenzymes plays a role in the production of hyaluronic acid, elongating the polymer by the repeated addition of glucuronic acid and N-acetylglucosamine. Although these isoenzymes share some similarity in terms of gene sequence (50 to 71% identity), they are located on different chromosomes (4,5).

Hyaluronic acid (HA) is widely present in the extracellular matrix (ECM) of the skin, which constitutes the largest organ in the human body. Their existence is fundamental to rheological characteristics; referring to deformation and fluidity, hygroscopic; water-holding capacity; and, viscoelastic fabric. Although HA has been confirmed to be related to the skin's repair process, the mechanisms underlying its influence on this process have not yet been fully elucidated. On the other hand, hyaluronic acid has been shown to play a crucial role in the different stages of skin healing, ranging from the inflammatory phase to the proliferative and remodeling phases (4,5,6).

It is interesting to note that, through small chemical modifications in the HA molecule, it has been possible to create polymers that are highly compatible with the body, such as the benzyl ester, known as Hyaff biomaterials. These polymers are used to manufacture various products such as non-woven meshes, gauze, membranes, and tubes. When cells are seeded in these biomaterials, substitutes for tissues such as dermis, cartilage, and bone are generated (7). Polymer chemistry and biomaterials engineering enable the creation of tissue substitutes and medical products that are highly compatible with the body, which has great potential in regenerative medicine and the repair of damaged tissues (8).
According to Saad A, et al, (9), side effects related to the use of hyaluronic acid are uncommon and tend to be localized, these adverse effects include bruising, infection, localized redness, and allergic reactions. On the other hand, complications that arise in the long term may include the appearance of foreign body granulomas, chronic deep infections, and cross-reactions between different types of fillers, manifesting as swelling, discoloration, nodules, and ulcers (5,6). These side effects and complications can occur in hyaluronic acid filler procedures, regardless of whether they are performed with or without the use of ultrasound guidance, however, the use of ultrasound can help medical professionals achieve a more accurate injection, minimize risks, and ensure that hyaluronic acid is placed in the desired location (9).

Therefore, the use of guided ultrasound can be a valuable tool to increase the safety of hyaluronic acid filling procedures, as it allows the detection and evaluation of the quantity, location, and depth of hyaluronic acid fillers that have been injected (10). Experienced, this facilitates precise delivery of hyaluronidase within the area to be augmented, in the case of buttock augmentation duplex ultrasound

can be employed to identify vascular structures in the area where the buttock augmentation treatment is planned to be performed, helping to reduce the risk of complications (9,10).

Given the above, the present research aims to analyze the guided ultrasound technique for buttock augmentation with high molecular weight hyaluronic acid, in order to provide a complete view of this technique, from its practical application to its results and safety considerations. This study is justified by the growing demand for buttock augmentation procedures and the need for safer, less invasive options. The combination of high molecular weight hyaluronic acid and ultrasound represents an innovative approach that deserves a thorough evaluation (8).

Researching this technique is critical to providing valuable information to both healthcare professionals and patients seeking reliable and effective aesthetic procedures. In addition, by addressing the safety and efficacy of this technique, this study may contribute to establishing guidelines and standards of good practice in the field of plastic and aesthetic surgery. Ultimately, this work seeks to provide a solid foundation for informed decision-making in the realm of buttock augmentation.

On the other hand, the safety and well-being of patients are of utmost importance in medical and aesthetic practice. Guided ultrasound can help minimize risks and complications, warranting research to ensure patient safety. The development of this technique represents a breakthrough in the field of aesthetic medicine and can provide medical professionals with a valuable tool to improve the accuracy of buttock augmentation procedures. In addition, the research will generate evidence-based data that can enrich the scientific and medical literature, providing solid information for future procedures and advances in this area. The results of the research can translate into a real benefit for patients, seeking greater safety, better outcomes, improved satisfaction, and a more positive overall experience in ultrasound-guided hyaluronic acid buttock augmentation procedures.

Methods

The focus of this research is to conduct a comprehensive analysis of the ultrasound-guided high molecular weight hyaluronic acid buttock augmentation procedure. To achieve this, a series of detailed clinical cases will be used that represent real examples of its application, taking as inclusion criteria; Patients over 18 years of age, patients undergoing buttock augmentation with high molecular weight hyaluronic acid guided by ultrasound and patients without previous procedures in the area to be treated. Also, as exclusion criteria; patients under 18 years of age, patients who have a history of allergic reactions to hyaluronic acid or who are pregnant and breastfeeding, and patients with buttock prostheses.

A total of 60 patients were considered as a universe and sample during the period between 2022 and 2023. However, for this particular study, 6 patients were carefully selected as a representative sample. Ethical considerations include ensuring the confidentiality of information, as well as respecting the rights and well-being of participants.

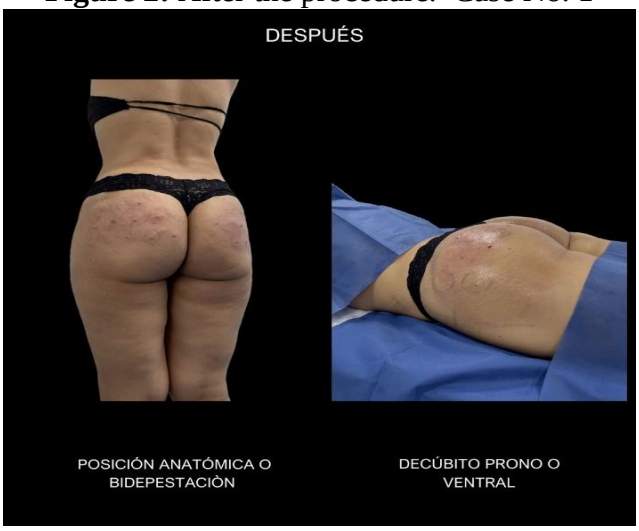
The technique is developed mainly according to a central axis, which is determined according to the patient's anatomy. The highest projection point of the buttock should be aligned with the pubic symphysis, drawing a horizontal line from the pubic symphysis towards the buttock is the highest point of projection. Once this point is identified, hyaluronic acid begins to infiltrate, creating a column that runs from the muscle to the dermis. Subsequently, several columns are marked around this central column and smaller amounts of hyaluronic acid are filtered than in the central column, thus creating a dome effect.

With the help of echo, the areas with less fat density are determined in order to infiltrate hyaluronic acid and achieve an adherent and homogeneous appearance in the shape of the buttocks. In terms of planning, the amount of hyaluronic acid to be used is determined, which depends on the anatomical size of the buttock and the patient's wishes. For example, if it is a patient who wants to increase her buttock volume, the minimum to observe a significant change is usually 2 ampoules per buttocks, which is equivalent to 100 cc per buttocks, taking into account that each ampoule contains 50 cc, and if more volume is desired, more ampoules can be added.

Results

Figure 1: Before the procedure. Case No. 1

Figure 2: After the procedure. Case No. 1



Case Presentation: A 40-year-old patient was treated for 4 blisters on June 28, 2022. After the procedure, the patient reported a 100% satisfaction level.

Figure 3: Before the procedure. Case No. 2

Figure 4: After the procedure. Case No. 2

Case presentation: A 58-year-old patient underwent treatment for 4 ampoules on February 18, 2022. The procedure was satisfactory, and the patient expressed 100% satisfaction.

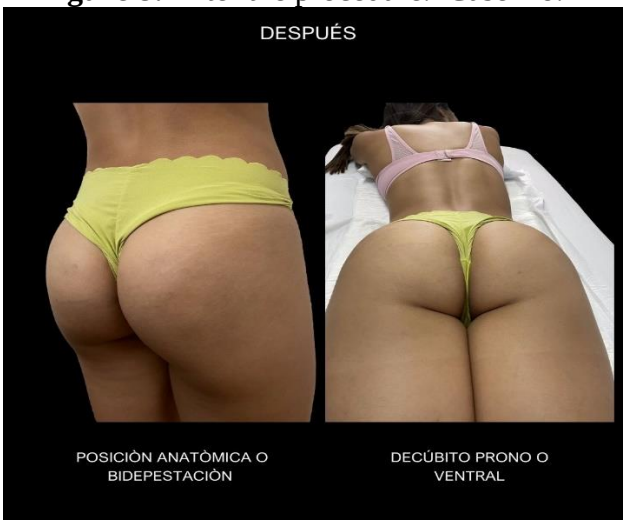
Figure 5: Before the procedure. Case No. 3

Figure 6: After the procedure. Case No. 3

Case Presentation: A 50-year-old patient was treated for 4 ampoules on January 18, 2022. The procedure was carried out successfully, and the patient reported a 100% satisfaction level.

Figure 7: Before the procedure. Case No. 4

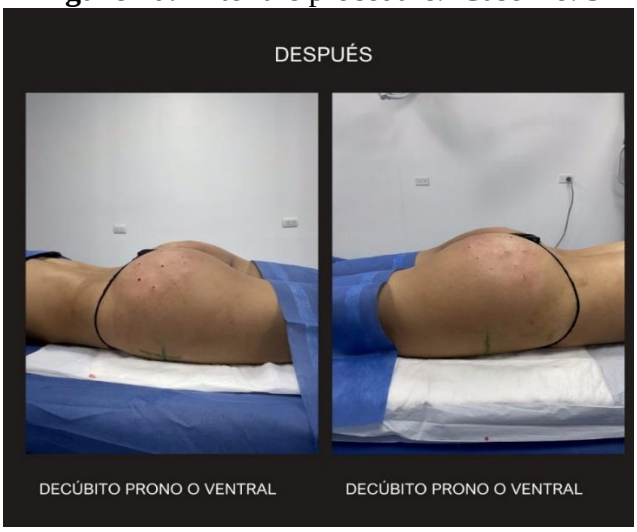
Figure 8: After the procedure. Case No. 4



Case Presentation: A 29-year-old patient sought treatment for 4 ampoules on August 28, 2023. After the procedure, the patient expressed a 100% satisfaction level.

Figure 9: Before the procedure. Case No. 5

Figure 10: After the procedure. Case No. 5



Case presentation: A 48-year-old patient underwent treatment for 8 ampoules on June 22, 2022. The procedure was successful, and the patient expressed a 100% satisfaction level.

Figure 11: Before the procedure. Case No. 6

Figure 12: After the procedure. Case No. 6

Case Presentation: A 35-year-old patient was treated for 2 blisters on June 8, 2022. The procedure was successful, and the patient reported a 100% satisfaction level.

Effectiveness and characteristics of the procedure

The ultrasound-guided procedure for buttock augmentation with high molecular weight hyaluronic acid represents an outstanding innovation in the field of non-surgical body contouring, being an advanced injectable dermal filler. At its core, this process is distinguished by containing cross-linked hyaluronic acid, a component that testifies to French biotechnological advances. Cross-linked hyaluronic acid, characterized by its cross-molecular structure, is renowned for its ability to provide sustained volume augmentation and long-lasting aesthetic results, this dermal filler has been specifically designed to elevate body contours, with a particular focus on areas such as the buttocks and thighs.

The precise application of hyaluronic acid in these regions seeks to enhance volume in a natural and harmonious way, offering a non-surgical alternative for those seeking aesthetic improvements in their body figure. Moreover, the advanced formulation of the process is presented in sterilized disposable bottles, ensuring safety and hygiene during the injection procedure, this prepared and ready-to-inject presentation simplifies administration by medical professionals, ensuring convenient and safe application. The transformational experience with the procedure is distinguished by its ability to provide results that feel as natural as they appear, this promise reflects the pursuit of an aesthetic change that is not only visually appealing, but also retains the authenticity of the natural anatomy.

As for the effectiveness of the process, it manifests itself as a journey towards lasting beauty, where each application stands as a significant step to timeless elegance and youthful vitality, presenting itself as a compromise where longevity is effortlessly intertwined with aesthetic pursuit, without fear of complications such as scars. The durability and guarantee of the way hyaluronic acid is applied translates into a shelf life of months, ensuring remarkable beauty effects that, with attentive care, can extend for years. This phenomenon is supported by its intrinsic harmonization with human physiology and its rigorous adherence to safety standards, which allow its seamless integration and gradual dissolution in sync with the body's natural metabolic cycles.

Discussion

In contrast to previous findings, the study by Keizers et al. (11) sheds light on the significant differences in terms of risks associated with intensely cross-linked hyaluronic acid (HA)-based products compared to non-cross-linked or minimally cross-linked HA-based products. While previous results advocated for the efficacy and safety of procedures, Keiser findings underscore the need for careful evaluation of HA cross-linking in products for aesthetic procedures. It is crucial to note that discrepancies in results between studies can be due to a variety of variables, including the specific characteristics of the products, the study methodologies employed, and the patient populations evaluated.

On the other hand, Orozco (12) explains in his research that a higher degree of cross-linking can increase the viscosity and duration of the HA, which may be consistent with the search for long-lasting results in aesthetic procedures. However, it is noted that too high a degree of crosslinking could present challenges in terms of injection and risk of immune reactions, this suggests the importance of balancing cross-linking to optimize durability without compromising safety. As far as the results found in the present research are concerned, the chemical factors of HA highlight the right combination of cross-linking, concentration, molecular weight and gel type can significantly influence the durability of the results, providing a basis for making informed decisions and optimizing the efficacy of procedures such as buttock augmentation.

Souto et al (13), highlights several benefits associated with buttock augmentation using dermal fillers, underlining the non-surgical nature, customization, minimized downtime, and reversibility of results. The prominence of the non-surgical nature in the buttock augmentation procedure with dermal fillers highlights the growing preference for minimally invasive interventions in the pursuit of aesthetic

results. Similarly, the reduction of scars, the lower risk of infection and the shortened recovery periods are determining factors that strengthen the attraction of patients to non-surgical alternatives.

At the same time, the ability to customize and adjust emerges as an essential benefit, evidencing the ability of health professionals to precisely adapt the procedure to the specific aesthetic needs and goals of each patient, thus contributing to more satisfactory results, the importance of minimized downtime underscores the convenience associated with dermal fillers, allowing patients to resume their daily activities efficiently, in stark contrast to surgical procedures, which often involve extended recovery periods. Finally, the reversibility of results, a unique feature of dermal fillers, provides patients with the ability to make adjustments according to their preferences or explore alternatives in the future, providing greater security and flexibility in their aesthetic decisions. These benefits converge to highlight the key advantages of applying dermal fillers in buttock augmentation (14).

From the perspective of Salahia and Dar (15), there are several aspects that contribute to the widespread acceptance of dermal fillers, pointing to their non-invasive nature, shorter recovery time, easy availability, greater efficacy and lower side effects, these factors can be understood as the fundamental drivers that have positioned dermal fillers as a popular choice in aesthetic procedures. The preference for the non-invasive nature reflects the growing demand for aesthetic procedures that minimize the need for more extensive surgical interventions, as presented in the results of the present research where HA is used without requiring significant incisions, which in turn can translate into fewer complications and shorter recovery periods.

In the study by Robles et al. (16), cross-linked hyaluronic acid was used to fill the nasal folds, evidencing that this procedure rigorously adheres to the criteria for evaluating safety, effectiveness and longevity to be analyzed in relation to Cross-Linked Hyaluronic Acid (AHR). The key finding revealed a longevity of AHR at the sites of the superficial and deep levels of dermal tissue, extending beyond 9 months, the results indicated that AHR is a safe filler, as the side effects experienced were mild and were within the parameters described in similar products previously studied, as well as the present research where patients expressed a high level of satisfaction.

The study by Kim et al (17) states that HA provides good results in achieving aesthetic goals, the ability of HA to improve the appearance and texture of the skin, among other applications, supports its use in aesthetic procedures. As far as the results of the present research are concerned, the application of ultrasound as a guide provides an additional layer of precision and control, allowing a more specific adaptation of the material according to the individual anatomy of each patient. Taken together, these considerations support the usefulness of HA in buttock augmentation and underscore its position as a safe and effective option in contemporary aesthetic practice.

In his research, Master (18) highlights the repair of the extracellular matrix and the participation in cellular processes with the use of HA, since its functions may be crucial for the proper integration of the material into tissues and its interaction with surrounding cells. Both the author's claim and the present research on; Buttock augmentation with high molecular weight hyaluronic acid guided by ultrasound, highlight the importance and effectiveness of HA in healing and mass increase processes, such as the buttocks. The specific application of HA in the procedural context prevails its versatility and potential in different medical and aesthetic applications. These commonalities underscore the relevance and breadth of hyaluronic acid's contributions in various areas of medicine and health.

Conclusions

Research on hyaluronic acid (HA) in the context of ultrasound-guided buttock augmentation reveals significant findings and key points influencing the safety, efficacy and durability of aesthetic procedures.

- The successful application of HA techniques in 6 patients of different ages reinforces its versatility

and ability to achieve satisfactory results in a wide range of populations. The precise choice of the injection location seeks to enhance volume in a natural and harmonious way, offering a non-surgical alternative to improve the body figure.

- In contrast to previous research, the influence of HA cross-linking highlights the importance of carefully evaluating cross-linking in products for aesthetic procedures. Similarly, some research addressed the need to balance cross-linking to optimize durability without compromising safety, and the results of the present research support the importance of the right combination of HA chemical factors to influence the durability of results.
- As for the benefits of buttock augmentation with dermal fillers, the prominence of the non-surgical nature, customization, and reversibility of the results is confirmed. In short, the application of HA and the understanding of the key factors in buttock augmentation offer an advanced, safe and personalized aesthetic option. The integration of these findings provides a solid foundation for informed decision-making and optimization of outcomes in non-surgical aesthetic procedures.
- The study also reveals that with (HA) there is no limitation in terms of the amount in relation to a toxic effect. However, there is a limitation in terms of cost-benefit, as there will come a point where adding more HA will increase the cost without providing a significant change in the aesthetic result. It is crucial to consider the moment when the buttock acquires a harmonious appearance and stop the procedure at that point, which will depend on the individual body structures of each patient. It has been observed that the maximum amount of HA applied per patient is 5 ampoules per buttock, which is equivalent to a total of 10 ampoules, or 500 cc between both buttocks. This finding underscores the importance of individualized evaluation and moderation in the amount of HA used to ensure optimal aesthetic results and a favorable cost-benefit ratio.

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