

Gluteal Augmentation Using Dermal Fillers: A Comprehensive Review of Techniques and Outcomes

Denis Souto Valente^{1*}, Vinicius Kayser¹, Lucas Kieling¹, Ana Terezinha Konzen¹, Thales Fernando Canabarro Araujo¹, Gabriel Fiorio Grando², Mariana Graeff Bins Ely³, and Rafaela Koehler Zanella³

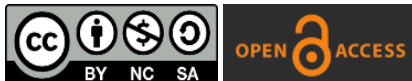
¹Division of Surgical Clinics, Federal University of Medical Sciences of Porto Alegre, Brazil

²School of Medicine, Lutheran University of Brazil, Brazil

³School of Medicine, Pontifical University Catholic of Rio Grande do Sul, Brazil.

***Corresponding author:** Valente DS, Division of Surgical Clinics, Federal University of Medical Sciences of Porto Alegre, Brazil; Tel: +555121032886; E-mail: [denis.valente\[AT\]ufcspa.edu.br](mailto:denis.valente[AT]ufcspa.edu.br)

Received: July 07, 2023; **Accepted:** August 13, 2023; **Published:** August 30, 2023



All articles published by Gnoscience are Open Access under the Creative Commons Attribution License BY-NC-SA.

Abstract

Buttock augmentation has witnessed a surge in popularity as more individuals seek to enhance the size and shape of their buttocks. Traditional surgical methods, such as gluteal implants and fat transfer, have been widely employed to achieve this goal. However, the emergence of dermal fillers as a minimally invasive alternative has garnered significant attention in recent years. This article presents a comprehensive review of gluteal augmentation using dermal fillers, encompassing a detailed examination of the techniques involved, patient selection criteria, safety considerations, and potential outcomes. The objective of this review is to analyze existing literature and clinical experiences to offer valuable insights into the efficacy, longevity, and potential complications associated with gluteal augmentation using dermal fillers. A thorough exploration of the various techniques employed in this procedure will be provided, focusing on the strategic placement and volume of dermal fillers to achieve a fuller and more contoured appearance of the buttocks. Patient selection criteria will be thoroughly discussed, taking into consideration factors such as overall health, body type, and realistic expectations. By providing a clear understanding of suitable candidates, this review aims to assist patients and practitioners in making informed decisions regarding the appropriateness of gluteal augmentation with dermal fillers. Safety considerations will be emphasized throughout the article, as maintaining patient safety is of paramount importance. Potential risks and complications associated with dermal fillers for gluteal augmentation will be addressed, advocating for the necessity of seeking treatment from qualified and experienced practitioners. In addition, the article will delve into the outcomes and longevity of gluteal augmentation with dermal fillers. An analysis of existing data will be presented to ascertain the duration of results and potential need for touch-up sessions over time. In conclusion, this comprehensive review intends to shed light on the intricacies of gluteal augmentation with dermal fillers, providing practitioners and patients with evidence-based insights. By presenting a balanced evaluation of techniques, safety considerations, and outcomes, this article aims to facilitate an informed and confident approach to buttock enhancement procedures.

Keywords: *Buttocks augmentation; Dermal fillers; Gluteal enhancement; Plastic Surgery; Injectable fillers.*

Citation: Valente DS, Kayser V, Kieling L, et al. Gluteal augmentation using dermal fillers: A comprehensive review of techniques and outcomes. Case Rep Rev Open Access. 2023;4(2):131.

1. Introduction

Gluteal augmentation, the process of enhancing the size and shape of the buttocks, has experienced a remarkable surge in popularity in recent years. The appeal of a well-proportioned and contoured buttock region is deeply ingrained in cultural ideals of attractiveness and aesthetic beauty [1]. Traditionally, surgical approaches, such as gluteal implants and fat transfer, have been the go-to methods for achieving these desired outcomes [2]. However, these procedures are often associated with significant invasiveness, prolonged recovery periods, and the potential for complications [3].

In response to the growing demand for less invasive options, gluteal augmentation using dermal fillers has emerged as a promising alternative [4]. Dermal fillers, typically composed of hyaluronic acid or other biocompatible materials, present a non-surgical approach to buttock enhancement. By strategically injecting fillers into specific areas of the buttocks, volume and projection can be increased, resulting in improved contour and aesthetic outcomes [5].

This article seeks to contribute to the understanding of gluteal augmentation using dermal fillers, specifically targeting healthcare professionals. By providing evidence-based guidance, our aim is to enhance clinical practice and contribute to ongoing discussions regarding the safety, efficacy, and long-term outcomes of this procedure. The utilization of dermal fillers for gluteal augmentation represents a significant advancement in the field of aesthetic procedures, warranting a thorough review and comprehensive analysis. As such, this review aims to bridge the gap in knowledge and provide practitioners with valuable insights to make informed decisions and offer the best possible care to their patients.

2. Materials and Methods

2.1 Study Design

This article presents a comprehensive literature review of published studies and scientific literature related to the use of dermal fillers for buttock augmentation.

The review encompasses studies conducted across multiple geographic regions and various publication dates up until the knowledge cutoff date of May 2023.

2.2 Search Strategy

A systematic search of electronic databases, including PubMed, Scopus, and Google Scholar, was conducted to identify relevant studies.

The search strategy employed a combination of keywords, including "dermal fillers," "buttock augmentation," "gluteal enhancement," "injectable fillers," and related terms. Additional articles were identified by reviewing the reference lists of relevant studies and conducting manual searches of essential plastic surgery and dermatology journals.

2.3 Study Selection

Initial screening of the search results involved assessing titles and abstracts for relevance to the topic of dermal fillers for buttock augmentation. Full-text articles were then retrieved for further evaluation based on their potential contribution to the review objectives.

Studies were included if they reported on using dermal fillers for buttock augmentation, presented clinical outcomes, or provided relevant information on techniques, complications, safety, and patient satisfaction.

2.4 Data Extraction and Synthesis

Data extraction was performed from the included studies using a standardized form. Information extracted included study characteristics (e.g., authors, publication year), study design, sample size, patient demographics, filler types, injection techniques, outcomes assessed, and key findings. The extracted data were synthesized narratively, focusing on summarizing the main findings and key themes across the studies.

2.5 Data Analysis

Given the nature of this review as a literature synthesis, it is essential to acknowledge that no formal statistical analysis, such as a meta-analysis, was conducted. While meta-analyses can provide valuable insights, their feasibility and appropriateness depend on the availability of data from homogeneous studies with similar methodologies and outcome measures. In the case of gluteal augmentation using dermal fillers, the literature available at the time of this review may not have met the stringent criteria required for conducting a meta-analysis. The findings from the included studies were qualitatively analyzed and synthesized to provide a comprehensive overview of the use of dermal fillers for buttock augmentation.

2.6 Limitations

It is essential to acknowledge that the findings of this literature review are based on previously published studies, and the quality and heterogeneity of the included studies may impact the strength of the evidence. The review is also susceptible to potential publication bias, as studies with positive outcomes may be more likely to be published.

2.7 Ethical Considerations

No ethical approval was required for this literature review as it involved the analysis of previously published data.

3. Results

For this comprehensive review of gluteal augmentation using dermal fillers, a total of 37 articles were included in the analysis. These articles were sourced from reputable scientific databases and peer-reviewed journals, encompassing studies and clinical experiences conducted by healthcare professionals across different geographical regions.

4. Discussion

Gluteal implants involve the surgical placement of silicone or cohesive gel implants to enhance the size and shape of the buttocks. Implant selection is based on the patient's anatomy, desired outcomes, and the surgeon's expertise. (6) The procedure typically involves creating a submuscular pocket through an incision in the gluteal crease or intragluteal fold. The implants are then carefully positioned and secured within the pocket. Gluteal implants offer a permanent solution for buttock augmentation but carry risks such as implant malposition, capsular contracture, infection, and implant-related complications [7].

Fat transfer, also known as autologous fat grafting or Brazilian butt lift, involves harvesting fat from one area of the body (e.g. abdomen, flanks) through liposuction and injecting it into the buttocks to enhance volume and contour [8]. The harvested fat is processed to purify and remove excess fluids. The fat is then strategically injected into different layers of the buttocks to achieve the desired augmentation. Fat transfer provides natural-looking results and carries a lower risk of complications than implants. However, the longevity of results can vary, and multiple sessions may be required for optimal outcomes [9].

Dermal fillers for gluteal augmentation typically comprise biocompatible materials such as hyaluronic acid, polymethylmethacrylate, poly-L-lactic acid or calcium hydroxylapatite [10]. Hyaluronic acid fillers are the most commonly used due to their reversible nature and safety profile. Different brands and formulations may have varying viscosities, particle sizes, and cross-linking densities, allowing for customization based on patient needs and preferences [11].

Injection techniques for gluteal augmentation using dermal fillers can vary depending on the desired outcomes and the patient's anatomy. The procedure is usually performed under local anesthesia. The filler is injected into specific buttocks areas, targeting regions that require volume enhancement or contour refinement [5]. Techniques such as linear threading, fanning, and cross-hatching may achieve an even distribution and natural-looking results. The depth and amount of filler injected depend on tissue quality, patient's preference, and the injector's experience [12].

Combination approaches involve combining surgical and non-surgical techniques for gluteal augmentation. This may include a combination of gluteal implants or fat transfer with dermal fillers to achieve optimal results. For instance, dermal fillers can refine the contours and address minor asymmetries after implant placement or fat transfer [9]. This approach allows for a more tailored and customized outcome based on the patient's needs [13].

By understanding and utilizing these gluteal augmentation techniques, healthcare professionals can offer patients various options for achieving their desired buttock aesthetics. The choice of technique depends on multiple factors, including patient's preferences, anatomy, desired outcomes, and practitioner's expertise [14]. Continued research and advances in gluteal augmentation techniques contribute to improving patient satisfaction and safety.

5. Patient Selection and Preoperative Considerations

Thorough patient assessment is crucial in selecting appropriate candidates for gluteal augmentation using dermal fillers. This assessment should include a comprehensive medical history, physical examination, and evaluation of the patient's aesthetic goals. Essential factors to consider during the patient assessment include general health, skin quality, body mass index, previous surgeries, allergies, and current medications [15]. It is essential to identify any contraindications or potential risks that may affect the safety and effectiveness of the procedure.

A psychological evaluation is an essential aspect of patient selection for gluteal augmentation. It allows healthcare professionals to assess the patient's motivation, expectations, and emotional well-being. Understanding the patient's psychological readiness and ability to cope with potential changes in body image is crucial for achieving satisfactory outcomes. Patients should have realistic expectations and a stable psychological state, as unrealistic expectations or body dysmorphia may lead to dissatisfaction with the procedure [16].

Informed consent is a critical component of the preoperative process. Patients must receive detailed information about the procedure, including the benefits, potential risks, limitations, and alternatives. They should be educated about the expected outcomes, possible complications, and the need for follow-up visits [10]. This information should be presented clearly and understandably, allowing patients to make an informed decision regarding their treatment. It is essential to address any questions or concerns the patient may have and provide written consent to ensure legal and ethical obligations are met.

Preoperative preparation plays a significant role in optimizing patient safety and procedural outcomes. This may involve specific recommendations and instructions, including:

- **Medication Management:** Patients should be advised to avoid medications that may increase the risk of bleeding or interfere with anesthesia. This includes non-steroidal anti-inflammatory drugs, herbal supplements, and blood-thinning medications. It is essential to consult with the patient's primary care physician or specialist to ensure appropriate management of medications before the procedure [17].
- **Smoking Cessation:** Patients who smoke should be strongly encouraged to quit smoking before the procedure, as smoking can impair wound healing and increase the risk of complications [17].
- **Preoperative Testing:** Depending on the patient's medical history and the specific requirements of the facility, preoperative tests such as blood work, electrocardiogram (ECG), and imaging studies may be necessary to assess the patient's overall health status and detect any underlying conditions that may affect the procedure [17].
- **Preoperative Instructions:** Patients should receive clear instructions regarding fasting requirements, preoperative skin preparation, and any specific clothing or accessory they should bring on the day of the procedure [17].
- **Support System:** Patients should be encouraged to arrange for a responsible adult to accompany them on the day of the procedure and assist with transportation and postoperative care [17].

By diligently evaluating and preparing patients for gluteal augmentation using dermal fillers, healthcare professionals can optimize safety, patient satisfaction, and procedural outcomes. Open communication, thorough assessment, and comprehensive preoperative preparation contribute to a successful treatment experience [18].

Gluteal augmentation using dermal fillers is typically performed under local anesthesia. The area is numbed using a local anesthetic such as lidocaine to ensure patient comfort during the procedure [12]. The dosage and technique for administering anesthesia should be tailored to the patient's needs and the extent of the planned augmentation.

The injection sites for gluteal augmentation using dermal fillers are strategically chosen based on the patient's anatomy and desired outcomes [19]. Common injection sites include the upper outer quadrants, lateral upper buttocks, and central buttock regions. Proper identification of anatomical landmarks, such as the posterior superior iliac spine, gluteal fold, and midline sacral dimple, is essential for accurately placing the fillers [20].

The choice of injection volumes and depths depends on the patient's desired outcomes, tissue quality, and the characteristics of the dermal filler used. The injections are typically performed in multiple layers, including the subcutaneous tissue and deep muscular fascia. The volumes and depths should be carefully determined for optimal augmentation, contour refinement, and natural-looking results [21].

Layering techniques involve sequentially injecting dermal fillers in different anatomical layers to achieve a harmonious and three-dimensional enhancement. This technique allows a gradual volume build-up and ensures an even distribution of the filler material [22]. Layering can be performed using a linear threading technique, where the filler is injected in a linear pattern, or a fanning technique, where the filler is injected in a fan-shaped pattern to achieve a smooth transition between areas [19].

The choice between a cannula and a needle for dermal filler injections depends on various factors, including the injector's expertise, patient's anatomy, and the specific technique used. Cannulas are often preferred for gluteal augmentation due to their flexibility, reduced risk of vascular injury, and decreased likelihood of causing tissue trauma. Needles may be used for precise injections in specific areas or when a more targeted approach is required. [23] Therefore, the choice between the two instruments should be based on the patient's individual needs and the clinician's experience.

Post-procedure care is essential for optimizing patient outcomes and minimizing complications. Patients should avoid pressure on the treated area for the first few days after the procedure. They should also refrain from strenuous activities and exercises that may strain the gluteal region excessively. Patients may experience mild swelling, bruising, or tenderness, usually subsiding within a few days. Providing patients with clear instructions regarding post-procedure care, including specific medications, skincare routines, and follow-up appointments, is essential [24].

By employing appropriate anesthesia techniques, utilizing precise injection sites and landmarks, determining optimal injection volumes and depths, implementing layering strategies, considering the choice between cannula and needle, and providing thorough post-procedure care, healthcare professionals can enhance the safety and effectiveness of gluteal augmentation using dermal fillers [25].

While gluteal augmentation using dermal fillers is generally considered safe, it is crucial to be aware of potential adverse events and complications. Common adverse events may include pain, bruising, swelling, and temporary asymmetry. Complications can occur but are relatively rare and may include infection, hematoma, necrosis, granuloma formation, vascular compromise, and allergic reactions. The risk of complications can be minimized through meticulous patient selection, proper injection technique, and adherence to safety protocols [10].

Prompt recognition and appropriate management of complications are crucial for patient safety and optimal outcomes. In the occurrence of an adverse event or complication, early intervention is vital. Management strategies may include conservative measures, such as local massage, warm compresses, and topical or systemic medications to manage swelling or pain. In cases of infection or necrosis, more aggressive interventions may be required, such as antibiotic therapy, surgical drainage, debridement, or consultation with specialists in wound care or plastic surgery [26].

Healthcare professionals should adhere to best practices and safety guidelines to avoid unwanted outcomes. This includes proper patient assessment, accurate injection technique, and adherence to anatomical landmarks. It is essential to thoroughly understand the relevant anatomy, including the location of major blood vessels and nerves, to minimize the risk of vascular compromise or nerve injury. Using the appropriate injection volumes and depths and employing layering techniques can also help achieve natural-looking outcomes and avoid overfilling or contour irregularities [27].

Long-term safety data regarding gluteal augmentation using dermal fillers is still evolving. Healthcare professionals must stay updated with the latest research and surveillance data to assess the long-term safety and efficacy of different filler products. Continued follow-up with patients and reporting any adverse events or complications to appropriate regulatory authorities or research databases can contribute to accumulating valuable long-term safety data [28].

By being knowledgeable about potential adverse events and complications, promptly managing any complications that arise, employing appropriate injection techniques, and staying informed about long-term safety data, healthcare professionals can provide safer and more effective gluteal augmentation using dermal fillers. Continued research, education, and communication within the medical community are essential to further enhance this procedure's safety profile [29].

Patient satisfaction is a critical measure of the efficacy of gluteal augmentation using dermal fillers. Several studies have shown high levels of patient satisfaction with this procedure [5], [10], [22]. Enhancing buttock volume and contour, improving body proportions, and achieving a more aesthetically pleasing appearance contributes to positive patient

experiences. Additionally, the non-surgical nature of the procedure, minimal downtime, and relatively low risk of complications compared to surgical approaches can positively influence patient satisfaction [22]. The longevity of gluteal augmentation using dermal fillers can vary depending on multiple factors, including the type of filler used, injection technique, patient metabolism, and lifestyle factors. Generally, the duration of results can range from several months to a couple of years [30].

Hyaluronic acid fillers typically provide temporary results, lasting around 6 to 18 months, as the body gradually metabolizes the filler. Although hyaluronic acid fillers are considered safe, it is essential to note that all medical procedures carry some level of risk. Complications can include injection site reactions (such as swelling, redness, and bruising), infection, vascular compromise, and, rarely, granuloma formation or migration [31]. However, these complications are generally infrequent and can often be managed or resolved with appropriate medical intervention [22].

Polymethylmethacrylate is a permanent filler used for various aesthetic procedures, including buttock augmentation [32]. Injections are generally considered irreversible and if complications arise, they may be challenging to manage. Complications can include infection, granuloma formation, hypercalcemia, and chronic inflammation. These complications may require additional surgical intervention to correct or may result in long-term aesthetic and functional issues [33].

Poly-L-lactic acid biocompatibility, biodegradability, and stimulatory effects on collagen production make it an attractive choice for buttocks augmentation [4]. Calcium hydroxylapatite fillers stimulate collagen production, leading to longer-lasting results, with effects observed for up to two years or more [34]. Although rare, potential complications with these fillers can include infection, granuloma formation, lumpiness, nodule formation, and vascular compromise. Unlike hyaluronic acid fillers, calcium hydroxylapatite and poly-L-lactic are not easily reversible; surgical intervention may be required to remove or adjust the filler [35].

Several factors can influence the longevity of gluteal augmentation using dermal fillers. These include [36]:

- **Metabolism and Body Physiology:** The individual metabolic rate and physiological factors can affect the rate at which the filler material is naturally broken down and absorbed by the body.
- **Filler Characteristics:** The composition and properties of the dermal filler used can influence its longevity. Fillers with higher cross-linking density and larger particle sizes provide longer-lasting results.
- **Injection Technique and Volume:** The injection technique employed, including the depth, layering, and volume of filler used, can affect the durability of the augmentation. Adequate injection depths and appropriate layering techniques can enhance filler retention and distribution, potentially prolonging the results.
- **Patient Lifestyle:** Factors such as weight fluctuations, exercise routines, and exposure to excessive heat or sunlight can impact the longevity of the results. Maintaining a stable weight and adopting a healthy lifestyle help optimize the duration of the augmentation.

- **Touch-up or Maintenance Treatments:** Some patients may opt for touch-up treatments or periodic maintenance sessions to sustain their desired results. These additional treatments can extend the longevity of the augmentation.

Healthcare professionals need to discuss these factors with patients during the preoperative consultation and set realistic expectations regarding the duration of the results. Regular follow-up appointments can monitor the longevity of the augmentation and provide opportunities for touch-up treatments or adjustments as needed [4].

By considering patient satisfaction, understanding the duration of results, and recognizing the factors influencing longevity, healthcare professionals can help patients make informed decisions and achieve satisfactory and long-lasting outcomes with gluteal augmentation using dermal fillers [14].

Gluteal augmentation using dermal fillers offers several benefits compared to traditional surgical approaches [13].

These benefits include:

- **Non-surgical Nature:** Dermal filler injections are minimally invasive procedures that do not require large incisions or extensive tissue manipulation. This results in reduced scarring, decreased risk of infection, and shorter recovery periods [13]
- **Customization and Adjustability:** Dermal fillers provide a high level of customization, allowing healthcare professionals to tailor the augmentation to the patient's specific needs and aesthetic goals. The ability to adjust the amount and location of filler during the procedure provides a more flexible approach [22].
- **Minimized Downtime:** With dermal fillers, patients can typically resume their daily activities soon after the procedure, as minimal downtime is involved. This is in contrast to surgical techniques, which often require a more extended recovery period and restrictions on physical activities [19].
- **Reversible Results:** In the case of dermal fillers, the results are temporary and can be reversed if desired. This allows patients to make adjustments or explore other options in the future.
- **While gluteal augmentation using dermal fillers has numerous advantages, there are also certain limitations to be considered:[12].**
- **Duration of Results:** The longevity of dermal filler results is limited compared to surgical techniques. Depending on the type of filler used, the effects may last from several months to a couple of years. Patients seeking more permanent outcomes may need to consider surgical alternatives [24].
- **Volume Enhancement Limitations:** Dermal fillers have volume limitations regarding how much augmentation can be achieved. Patients desiring significant increases in buttock size may not achieve their desired outcome with fillers alone [23].
- **Patient Selection:** Not all patients may be suitable candidates for gluteal augmentation using dermal fillers. Factors such as insufficient donor fat for fat transfer procedures or specific anatomical considerations may require a surgical approach [13].

The choice between surgical and non-surgical gluteal augmentation techniques depends on several factors, including patient preferences, anatomical considerations, desired outcomes, and overall health status. Surgical approaches, such as gluteal implants or fat transfer, offer more significant and long-lasting volume enhancements, making them suitable for patients seeking substantial changes in buttock size and shape. These surgical techniques may involve more extensive procedures, longer recovery times, and a higher risk of complications [9].

Non-surgical approaches using dermal fillers are preferred by patients who desire more subtle enhancements or who wish to avoid surgery and its associated risks and recovery periods. Dermal fillers offer a non-permanent solution that allows patients to assess their results and make adjustments over time. They suit patients with adequate skin elasticity and minimal sagging or ptosis [12].

Ultimately, the decision between surgical and non-surgical approaches should be based on a thorough consultation with the patient, considering their individual needs, expectations, and anatomical features. Healthcare professionals should provide comprehensive information about each approach's advantages, limitations, and potential risks to ensure that patients can make informed decisions that align with their goals and preferences [37].

As with any medical procedure, ongoing research and advancements are essential for further improving the outcomes and safety of gluteal augmentation using dermal fillers [10]. Future directions may include:

- **Long-term Safety and Efficacy Studies:** Conduct long-term studies to gather more comprehensive data on the safety and efficacy of dermal fillers used for gluteal augmentation.
- **Advancements in Filler Technology:** Continued development of filler products with improved longevity, biocompatibility, and natural-looking outcomes.
- **Refinement of Injection Techniques:** Further research and exploration of injection techniques, including optimizing injection volumes, depths, and layering strategies to enhance the longevity and natural appearance of results.
- **Patient Satisfaction and Quality of Life Studies:** Conduct studies to assess patient satisfaction, quality of life, and psychosocial impact after gluteal augmentation using dermal fillers.
- **Standardization and Guidelines:** Establishing standardized protocols and guidelines for gluteal augmentation using dermal fillers to ensure consistent and safe practices across different healthcare settings.

6. Conclusion

Gluteal augmentation using dermal fillers offers patients a non-surgical option for enhancing their buttock volume and contour. This article has provided valuable insights into the techniques, patient selection, preoperative considerations, procedure, safety aspects, efficacy, longevity, and a comparative analysis of surgical techniques. With proper patient assessment, adherence to safety protocols, and ongoing research, healthcare professionals can continue to optimize the outcomes and safety of gluteal augmentation using dermal fillers.

REFERENCES

1. Knoedler L, Odenthal J, Prantl L, et al. Artificial intelligence-enabled simulation of gluteal augmentation: A helpful tool in preoperative outcome simulation? *J Plast Reconstr Aesthet Surg*. 2023;80:94–101.
2. Trignano E, Tettamanzi M, Liperi C, et al. Outcomes of intramuscular gluteal augmentation with implants using tumescent local anesthesia. *Aesthetic Plast Surg* [Internet]. 2023. [Online]. Available: <http://dx.doi.org/10.1007/s00266-023-03342-x>
3. Oregi P, Khatib M, Cavale N, et al. Comparing the safety profiles of implants and autologous fat grafting in gluteal augmentation: A systematic review. *J Plast Reconstr Aesthet Surg* [Internet]. 2023;(23)83:463–474. [Online]. Available: <http://dx.doi.org/10.1016/j.bjps.2023.04.066>
4. Durairaj KK, Devgan L, Lee Bs A, et al. Poly-L-Lactic acid for gluteal augmentation found to be safe and effective in retrospective clinical review of 60 patients. *Dermatol Surg* [Internet]. 2020 Oct;46 Suppl 1:S46–53.
5. Santorelli A, Cerullo F, Salti G, et al. Gluteal augmentation with hyaluronic acid filler: A retrospective analysis using the BODY-Q scale. *Aesthetic Plast Surg* [Internet]. 2023;47(3):1175–1181.
6. Ibarra-Hurtado TR, Nuño-Guzmán CM, Ambriz-Plascencia AR, et al. Minimally invasive video-assisted submuscular gluteal augmentation with implants. An innovative technique.” *Plast Reconstr Surg* [Internet]. 2023. [Online]. Available: <http://dx.doi.org/10.1097/PRS.0000000000010732>
7. Aslani A, Del Vecchio D, Bravo MG, et al. The dual-plane gluteal augmentation: An anatomical demonstration of a new pocket design. *Plast Reconstr Surg* [Internet]. 2023;151(1):45–50.
8. Cao W and Sheng L. Buttock augmentation with fat grafting. *Clin Plast Surg* [Internet]. 2023;50(1):171–179.
9. Cansanção A and Condé-Green A. Gluteal fat augmentation: Best practices in Brazilian Butt Lift [Internet]. Springer Nature; 2021. 264p. [Online]. Available: <https://play.google.com/store/books/details?id=WvvgEAAAQBA>
10. Atiyeh B, Ghieh F, Oneisi A. Safety and efficiency of minimally invasive buttock augmentation: A review. *Aesthetic Plast Surg* [Internet]. 2023 Feb;47(1):245–259.
11. de la Guardia C, Virno A, Musumeci M, et al. Rheologic and physicochemical characteristics of hyaluronic acid fillers: Overview and relationship to product performance. *Facial Plast Surg* [Internet]. 2022 Apr;38(2):116–23. [Online]. Available: <http://dx.doi.org/10.1055/s-0041-1741560>
12. Lin MJ, Dubin DP, Khorasani H. Poly-L-Lactic acid for minimally invasive gluteal augmentation. *Dermatol Surg* [Internet]. 2020 Mar;46(3):386–394.
13. Chacur R, Menezes HS, Chacur NMB da S, et al. Replacement of gluteal implants by polymethyl methacrylate filler: case report. *Case Reports Plast Surg Hand Surg* [Internet]. 2019Jan4;6(1):20–24.
14. Lourenço LM, de Noronha MGO, Colla LA, et al. LL body contour technique-A new way of gluteal contouring and augmentation with hyaluronic acid filler. *J Cosmet Dermatol* [Internet]. 2022May;21(5):1967–1972.
15. Tapsale P, Türsen B, Türsen Ü. Off label uses of hyaluronic acid fillers: A review. *Dermatol Ther* [Internet]. 2022 Nov;35(11):e15876.
16. Milothridis P. Cosmetic patient selection and psychosocial background: A clinical guide to post-operative satisfaction [Internet]. Springer Nature; 2020. 100p. [Online]. Available:

https://play.google.com/store/books/details?id=_P_oDwAAQBAJ

17. Valente DS, Steffen N, Carvalho LA, et al. Preoperative use of dexamethasone in Rhinoplasty: A randomized, double-blind, placebo-controlled clinical trial. *JAMA Facial Plast Surg* [Internet]. 2015 May-Jun;17(3):169–73. [Online]. Available: <http://dx.doi.org/10.1001/jamafacial.2014.1574>
18. Christen MO. Collagen stimulators in body applications: A review focused on Poly-L-Lactic acid (PLLA). *Clin Cosmet Investig Dermatol* [Internet]. 2022;21;15:997–1019.
19. Almkhtar RM, Wood ES, Loyal J, et al. A randomized, single-center, Double-Blinded, Split-Body Clinical Trial of Poly-L-Lactic Acid for the treatment of cellulite of the buttocks and thighs. *Dermatol Surg* [Internet]. 2023 Apr 1;49(4):378–382.
20. Thomas M and D'silva J. *Manual of cosmetic surgery and medicine: Volume 1 - body contouring procedures* [Internet]. Springer Nature; 2023. 605p. [Online]. Available: <https://play.google.com/store/books/details?id=hdSkEAAAQBAJ>
21. Sadick NS. *Illustrated manual of injectable fillers* [Internet]. CRC Press; 2020. 178p. [Online]. Available: <https://play.google.com/store/books/details?id=b-sEAAAQBAJ>
22. Chacur R, Sampaio Menezes H, Maria Bordin da Silva Chacur N, et al. Gluteal augmentation with polymethyl methacrylate: A 10-year cohort study. *Plast Reconstr Surg Glob Open* [Internet]. 2019May;7(5):e2193.
23. Alam M, Kakar R, Dover JS, et al. Rates of vascular occlusion associated with using needles vs cannulas for filler Injection. *JAMA Dermatol* [Internet]. 2021;157(2):174–80.
24. Buzzaccarini G, Laganà AS, Borin M, et al. Los Deline copolyamide filler for breast and buttock augmentation. The position statement of the Italian Aesthetic Medicine Association (AMEI). *J Plast Reconstr Aesthet Surg* [Internet]. 2022;75(8):2831–70.
25. Lighthall JG. *Injectables and nonsurgical rejuvenation, Volume 30, Issue 3, an issue of facial plastic surgery clinics of North America, E-Book* [Internet]. Elsevier Health Sciences; 2022. 177 p. [Online]. Available: <https://play.google.com/store/books/details?id=KgKBEAAAQBAJ>
26. Kontis TC, Bunin L, and Fitzgerald R. *Injectable fillers: Panel discussion, controversies, and techniques. Facial Plast Surg Clin North Am* [Internet]. 2018May;26(2):225–36.
27. Lighthall JG. *Injectables and Nonsurgical Rejuvenation, An Issue of Clinics in Plastic Surgery, E-Book* [Internet]. Elsevier Health Sciences; 2023. 169p. [Online]. Available: https://play.google.com/store/books/details?id=nkq_EAAAQBAJ
28. Alexiades M, Palm MD, Kaufman-Janette J, et al. A randomized, multicenter, evaluator-blind study to evaluate the safety and effectiveness of VYC-12L treatment for skin quality improvements. *Dermatol Surg* [Internet]. 2023. [Online]. Available: <http://dx.doi.org/10.1097/DSS.0000000000003802>
29. Zhou SY, Kang SM, Gu YJ, et al. Bio-characteristics and efficacy analysis of biodegradable poly Dioxanone Dermal Filler in a Mouse Model and Humans. *In Vivo* [Internet]. 2023May-Jun;37(3):1093–102.
30. Sigrist RM, de Noronha MGO, Borelli SS, et al. Dynamic ultrasound evaluation of body fillers and biostimulators in the buttocks of fresh-frozen specimen. *J Cosmet Dermatol* [Internet]. 2022 Nov;21(11):5621–7.
31. Saad A, Iyengar KP, Davies AM, et al. A rare case of migration of hyaluronic acid gluteal injection to the medial

- thigh presenting as a soft lump. *Indian J Radiol Imaging* [Internet]. 2023Apr;33(2):253–256.
32. Blanco Souza TA, Colomé LM, Bender EA, et al. Brazilian consensus recommendation on the Use of polymethylmethacrylate filler in facial and corporal aesthetics. *Aesthetic Plast Surg* [Internet]. 2018 Oct;42(5):1244–51.
 33. Manfro AG, Lutzky M, Dora JM, et al. Case reports of hypercalcemia and chronic renal disease due to cosmetic injections of polymethylmethacrylate (PMMA). *J Bras Nefrol* [Internet]. 2021 Apr-Jun;43(2):288–92.
 34. Goldie K, Peeters W, Alghoul M, et al. Global consensus guidelines for the injection of diluted and hyperdiluted calcium hydroxylapatite for skin tightening. *Dermatol Surg* [Internet]. 2018 Nov;44 Suppl 1:S32–41.
 35. Casabona G. Combined calcium hydroxylapatite plus microfocused ultrasound for treating skin laxity of the chest and buttocks. *J Drugs Dermatol* [Internet]. 2022Jan1;21(1):27–30.
 36. Müller D, Prinz V, Sulovsky M, et al. Longevity and subject-reported satisfaction after minimally invasive jawline contouring. *J Cosmet Dermatol* [Internet]. 2022Jan;21(1):199–206.
 37. Dorfman RG, Gupta N, Saadat S, et al. Gluteal shape framework for augmentation surgery: A systematic review of the literature and proposed classification system. *Plast Reconstr Surg* [Internet]. 2023 May1;151(5):748e – 757e.

Citation: Valente DS, Kayser V, Kieling L, et al. Gluteal augmentation using dermal fillers: A comprehensive review of techniques and outcomes. *Case Rep Rev Open Access*. 2023;4(2):131.