

Gluteal Augmentation with Polymethyl Methacrylate: A 10-year Cohort Study

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ABSTRACT

Background: Many techniques for buttocks augmentation have been developed and published, for a more natural, satisfactory, and safe result for the patient. It has been a challenge to find a technique that presented not only volume gain but also gluteal remodeling.

Methods: A total of 1,681 patients who underwent gluteal augmentation with Polymethyl methacrylate (PMMA) between 2009 and 2018 were selected for this retrospective cohort study. Data collected included demographics, procedures data, and postoperative outcomes. Side effects were calculated and compared using the Student's t test.

Results: A total of 1,681 patients (1,583 women and 98 men) who underwent 2,770 gluteal fillings had their cases retrospectively analyzed. They were injected with 540,751.00 mL of PMMA injected. The patients' mean age was 39 years, and the mean volume injected in each section was 237 mL during the first procedure and 147 mL during the second procedure. The authors observed 52 cases presenting side effects, representing a rate of 1.88% of 2,770 procedures carried out. The statistically significant ($P = 0.02$) presence of side effects was detected in relation to the total filling volume.

Conclusion: This study has demonstrated that gluteal augmentation with PMMA is one of the best options for this type of procedure. In addition, the findings suggest that the guidelines concerning gluteal augmentation must include PMMA filler as an option because PMMA proved to cause few side effects, as demonstrated by this patient cohort.

Keywords: Gluteal augmentation; Dengue; Polymethyl methacrylate; Plastic surgery; Lipoinjection

INTRODUCTION

Plastic surgery for improving body contour of the gluteal region has been increasingly sought-after. Badin and Vieira have described a surgical technique for the placement of high-cohesive round silicone implants using video assistance [1]. Moreover, Jaimovich have described anchoring sutures, and Sozer described the use of musculocutaneous flap to increase the buttock in the middle portion and to decrease fat necrosis [2,3].

In an attempt to find an ideal surgical technique, Serra described easily identifiable anatomical landmarks that may assist the surgeon in performing gluteoplasty [4].

By using a different surgical technique, Sozer carried out a retrospective study with 10 patients who were submitted to a

buttock lift using the skin flap [5]. Patient satisfaction was high, as was in the study conducted by González-Ulloa, who noted a considerable improvement in the postoperative period in relation to patient/surgeon satisfaction [6].

According to the study by Chacur, it is possible to augment and shape the buttocks using injectable implants with various formulations. Fillers may be used in different regions of the body and face, and in each region, products with different properties may be used, such as PMMA, which is used in large muscle groups [7].

Lemperle studied the histological reaction with several substances for filling soft tissues: collagen (Zyplast, Allergan, Irvine, CA), hyaluronic acid (Restylane, Q-med, Uppsala, Switzerland), PMMA microspheres (Artecoll, Canderm Pharma Inc., Canada), silicone

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Received: January 28, 2021, **Accepted:** February 12, 2021, **Published:** February 19, 2021

Citation: Chacur R, Menezes HS, Bordin da Silva NM, Alves DD, Mafaldo RC, Gomes LD, et al. (2021) Gluteal Augmentation with Polymethyl Methacrylate: A 10-year Cohort Study. *Reconstr Surg Anaplastol*.10:175.

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oil (PMS 350, Vikomed, Germany), polylactic acid microspheres (New-Fill), dextran microspheres (Reviderm Intra, Medical International, Netherlands), polymethylacrylate (Dermalive, Dermatech, Paris, France), polyacrylamide (Aquamid, Contura - Denmark), polyvinylhydroxide microspheres suspended in acrylamide (Evolution), and calcium hydroxyapatite (FN). The host reacted differently to different fillers; however, all substances, being resorbable or nonresorbable, appeared to be clinically and histologically safe, even though all presented undesirable side effects [8].

Surgical indications of reconstruction and contouring of the buttocks due to malformation, asymmetry, trauma, and radiotherapy may require corrections made by regular implants, liposuction or lipoinjection, and skin flaps. Buttock implants for aesthetic purposes are widely used, especially in South America. Buttock implants are easy to place and present high success rate, whereas liposuction and lipoinjection procedures require considerable experience of the surgeon in fat injection [9].

The technique of placement of intramuscular silicone implants provided good results, which resulted in increasing number, consequently, of these procedures in Brazil. However, the data available in the medical literature reveal high rates of wound complications, in particular seromas and dehiscence. According to the study by Serra the use of adhesive points and the maintenance of good vascularization in the sacral region are the foundations for reducing complications in gluteoplasty with silicone implants [10].

According to the study by Chacur, PMMA has been used in medicine for more than 70 years. Among its uses are bone cements, contact and intraocular lenses, bone screw fixation, filling of bone cavities and defects of the skull, and stabilization of vertebrae in patients with osteoporosis or fractures. Even though there are several new promising alloplastic materials, the versatility and reliability of PMMA allow it to remain a popular and frequently used material.

Hilinski and Cohen demonstrated improved biocompatibility as a result of increased size and uniformity of PMMA microspheres. This enhanced biocompatibility results in fewer adverse events after the placement of ArteFill (Canderm Pharma Inc, Canada), thus providing a permanent volume increase because the nonabsorbable microspheres stimulate the fibroblasts that synthesize and cause collagen deposition around them. A similar study was also conducted by McClelland the appropriate technique includes deep subcutaneous implantation, with total correction, which is gradually achieved over several treatments. Complications are limited to the formation of nodules, which are easy to handle, and, in most cases, it can be done with conservative interventions.

In a histological study, Lee claim that the mixture of PMMA and cross-linked dextran in hydroxypropyl methylcellulose can be safely applied to increase soft tissue volume with longevity greater than 12 months. This study demonstrates gluteal augmentation with PMMA and identifies possible side effects and adverse reactions.

PATIENTS AND METHODS

All procedures performed in this study were in accordance with the ethical standards of the National Commission for Ethics in Research (CONEP), and the 1964 Declaration of Helsinki and its later amendments or similar ethical standards and approved by the ethical committee (CAAE protocol number 86722118.8.0000.5291).

Patients were assessed regarding demographics, procedure data, and outcomes. Data were obtained by chart review.

In this retrospective cohort study, cases of 1,681 patients who underwent 2,770 gluteal augmentation with PMMA procedures at the Leger Clinic (in Rio de Janeiro, São Paulo, and Porto Alegre, Brazil) from 2009 to 2018 were analyzed.

There are 3 brands of PMMA allowed in Brazil released by ANVISA (Federal Regulation Agency in Brazil), Biossimetric, MetaDerm (formerly Meta Crill) and Linnea Safe. The ANVISA releases the products for exclusive medical use where the volume varies as required and evaluation.

In this study, gluteal filling with PMMA (Linnea Safe 30% or Meta Crill 30%) is performed under local anesthesia, with the patient awake accompanying by watching the results through a mirror and actively participating in the decisions (see video, Supplemental Digital Content 1, which demonstrates a gluteal augmentation technique with PMMA filling, <http://links.lww.com/PRSGO/B42>).

The anesthetic and product infiltrations are performed with a 1-mm atraumatic blunt-tipped microcannula, which causes no vascular or nervous lesions in the gluteal muscles and no permanent scarring.

PMMA procedures gluteal filling is contraindicated in a pregnant patient, local infection, systemic infection, local active herpes, autoimmune disease, treatment with immunosuppression, history of keloid formation, history of nodule formation after use of PMMA, use of anticoagulant, in oncologic treatment and history of allergy to the components of the formula.

Student's t-test was used to verify the data obtained. Analysis of the recorded data took place at the Research Unit of the clinic by using the IBM SPSS Version 22.0 (IBM Corp., Armonk, N.Y.) and the Microsoft Excel (Microsoft Corp., Redmond, Wash.).

RESULTS

Ninety-eight men (5.8%) and 1,583 women (94.2%) patients had their cases retrospectively analyzed. Procedures used 540,751.00 mL of PMMA in 1,681 patients. They were submitted to 2,770 gluteal filling sessions, during which 2,002 were performed using Linnea Safe 30% (394,618.00 mL) and 722 using Meta Crill 30% (146,133.00 mL). The patients' mean age was 39.31 ± 10.4 years (ranging from 18 to 79 years).

There is no meaningful statistical association between the age group and the occurrence of complications ($P=0.291$), and age groups are from 18 to 29 years ($N=258$; 15.31%), from 30 to 39 years ($N=745$; 44.33%), from 40 to 49 years ($N=416$; 24.75%), and from 50 to 79 years ($N=262$; 15.61%). Most patients were between ages 30 and 39 years (44.33%). Mean volume per session vary from 237.12 mL on first session to 86.00 mL on last session (Table 1).

Table 1: Mean volume per session.

	N	Mean	SD
Volume in session 1	1,681	237.12	73.83
Volume in session 2	731	147.6	82.63
Volume in session 3	221	129.61	78.26
Volume in session 4	72	122.57	75.02
Volume in session 5	34	105.03	75.32
Volume in sessions 6-10	31	86	68
Total of sessions	2,770		

Only 592 patients had a single application of PMMA (35.21%). More than half of the patients took, on average, 148.91 days (147.85) to have the second procedure performed (Table 2). The delay time between sessions was not related to side effects. Of a total of 1,681 patients (2,770 procedures), 52 presented side effects, and only 2 patients presented surgical-site infections, representing a rate of 0.07%. The most frequent side effects were hematomas (0.36%), seromas (0.29%), and ecchymoses (0.26%). Nevertheless, 98.12% of the procedures presented no side effects. There was no statistically significant difference between the mean age of the patients presenting complications (40.31 years) and the mean age of patients who did not present complications (39.99 years; $P=0.783$).

Table 2: Time interval (Days) between sessions.

	N	Mean	SD
Days between session 1 and 2	731	148.91	147.85
Days between session 2 and 3	221	238.8	214.36
Days between session 3 and 4	72	263.7	169.22
Days between session 4 and 5	34	223.38	226.42
Days between session 6 and 10	31	136.33	210.33
Average time between sessions	217.8	202.22	193.63

There is a statistically significant difference between the mean total volume per session of 24 patients presenting complications (408.42 ± 196.2 mL) and of 1657 patients who did not present complications (326.64 ± 176.26 mL; $P=0.024$).

In the first session, there was no statistically significant difference between the mean volume per session of patients who presented complications (256.75 mL) and who did not present complications (236.84 mL; $P=0.190$).

Taking under consideration the second session, there was no statistically significant difference between the mean volume per session of patients presenting complications (139.44 mL) and of patients without complications (147.81 mL; $P=0.672$). Equally, in the third session, there was no statistically significant difference between the mean volume of patients who presented complications (134.00 mL) and those who did not (129.46 mL; $P=0.815$).

DISCUSSION

Nowadays, there is a steady increase in the demand for buttock augmentation. Most of the procedures are silicone implant surgeries, which present risks inherent to the technique and the type of the surgical approach, which can be associated with skin flap, liposculpture, and implant placement techniques. Taking all relevant studies from 1980 to 2012 under consideration, Oranges¹⁵ performed a systematic review on the gluteal augmentation techniques about negative effects on postoperative outcomes of gluteal augmentation techniques.

CONCLUSION

This study has demonstrated that PMMA is one of the best options for gluteal augmentation. Cases of more than 1,600 patients (over 2,770 procedures) were considered, which represents the first demonstration in a large multicenter study that studied the benefits of PMMA filler in gluteal augmentation.

Body contouring surgeries, especially gluteal augmentation, are elective procedures, which make it even more important the postoperative risk assessment, thus further strengthening the significance of this study. In addition, findings suggest that the guidelines concerning gluteal augmentation must include PMMA filler as an option because the substance has been proved to cause few side effects, as demonstrated by this patient cohort.

ACKNOWLEDGMENTS

The authors thank Dr. Eduardo Luiz da Costa for providing analysis of the PMMA'S performed by LABMIC, Microscopy Laboratory of UFG, Federal University of Goiás (Institute of Physics).

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