



Intramuscular use of pmma microspheres for treating calf poliomyelitis atrophy: a case report

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Abstract

Introduction: One of the sequelae of poliomyelitis is muscle atrophy, which presents with decreased muscle mass, especially in the lower limbs. Besides functional treatment, it is important to consider aesthetic treatment to correct muscle asymmetry because this condition negatively affects the quality of life. **Case description:** In this report, we describe the case of a female patient with muscle atrophy in the left calf due to poliomyelitis sequelae who was treated with intramuscular implantation of polymethylmethacrylate (PMMA) microspheres. **Results:** Obtained an increase of 7 cm in the circumference of the left calf after the end of the treatment. **Conclusion:** The result obtained with the intramuscular filling was effective in treating calf muscle asymmetry.

Keywords: Poliomyelitis. PMMA. Muscle Atrophy. Calf.

Introduction

Poliomyelitis is a viral disease affecting children and adults known as infantile paralysis [1]. One of its sequelae is unilateral muscle atrophy in the lower limbs [2-4], which leads patients after functional treatment to seek aesthetic corrections.

Polymethylmethacrylate (PMMA), in its injectable presentation of 40micra microspheres suspended in a hydrogel vehicle, has been used for 30 years in aesthetic treatments [5]. In the intramuscular injection, it is deposited in the perimysium of the bundles, initiating a foreign body recognition response composed of macrophages and fibroblasts. The increase in the volume

of the muscle area implanted with PMMA is due to neocollagenesis and neoangiogenesis resulting from the envelopment of the microspheres with collagen [6-8].

This study presented a case of an adult female patient who underwent volumetric and aesthetic correction of calf muscle atrophy due to poliomyelitis sequelae, with injections of 30% PMMA microspheres in an aqueous gel vehicle, in 3 sessions.

Case Report

Study Design

The present case report study followed the CARE rules – Case Report. Available at: <https://www.care-statement.org/>. Accessed on: 06/28/2023.

Ethical Approval

The study was approved by the Ethics Committee for Human Research - Uniavan University Center under opinion number 5.740.799.

Patient Information and Clinical Findings, Timeline, Diagnostic Assessment, Therapeutic Intervention and Follow-up

A 35-year-old female patient presented with a reduction in muscle volume in the left calf (Figure 1) due to sequelae of poliomyelitis in childhood. Until then, she had not undergone esthetic treatments but only surgery for functional corrections.

Figure 1: Patient with muscular atrophy of the left lower limb due to poliomyelitis, first consultation, anterior (A), lateral (B), and posterior (C) views.

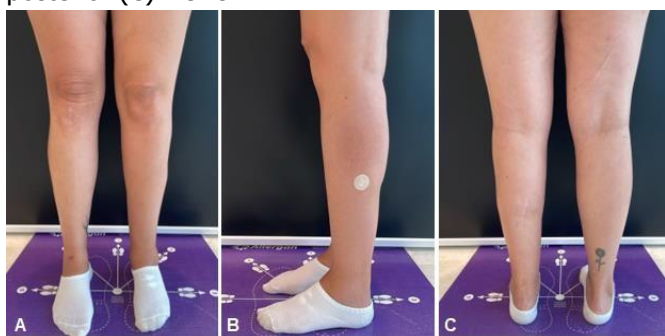


On physical examination, the maximum calf circumference was measured, perpendicular to the longitudinal line using an inelastic tape measure. The left calf measured 25 cm and the right calf 35 cm. Local anesthesia of the skin and intramuscular of the left leg was performed with an anesthetic solution of 10 ml of 2% lidocaine and 10 mL of saline. With a 21Gx7cm cannula, the injection of 30% PMMA was performed in the gastrocnemius muscle, in its lateral and medial portions, in retro-injection, with 90mL of the product in the first intervention.

At 47 days after the initial intervention, the second stage of the procedure was performed with a 30mL injection; at 88 days, the third stage was performed with 60 mL in the same area, technique, and product, totaling 180mL of PMMA 30% for treating the left gastrocnemius.

At 120 days, the patient returned for revision, showing visual improvement of the muscle asymmetry (Figure 2). The maximum circumference of the left calf at 120 days of intervention was 32cm.

Figure 2. Patient 120 days after the first visit and 3 PMMA applications, anterior (A), lateral (B), and posterior (C) views.



The patient had no adverse events associated with the procedure, except pain on walking in the first 20 days, which was treated with paracetamol 500mg and codeine 30mg, in the first 7 days and after with dipyrone monohydrate 300mg, reporting improved self-esteem with the result of the procedure.

Discussion

Among the main sequelae of polio is residual muscle atrophy and weakness, which usually involves the calf muscles. The weakness of these muscles leads to gait deviations, unilateral calf atrophy and/or length deficiency from one limb to the other, and visual asymmetry of the muscles. There is also a late-stage known as post-polio syndrome (PPS), characterized by new muscle weakness and/or muscle fatigability that occurs many years (even decades) after the initial illness. Due to aging and PPS, gait deviations can lead to mobility problems such as instability, pain, and fatigue when standing and walking [2,4]. All of these conditions can negatively impact the quality of life and cause low self-esteem and depression.

Treatment requires an individualized approach. Interventions may include rehabilitation management strategies, adaptive equipment, orthopedic equipment, gait/mobility aids, and various therapeutic exercises. It is important to address biomechanical changes and treat related sequelae [9].

However, these modalities do not improve muscle asymmetry or aesthetic complaints. Among the options for interventional treatments are implants (silicone), lipografts, and filler injections (such as PMMA). All of them present good results; however, the first two consist of surgical procedures with cuts and a more delicate postoperative period. Among the complications that can occur with implants are seroma, pathological scarring, suture dehiscence, capsular contracture, rupture, bad implant positioning, compartment Syndrome. In lipografting complications can be lack of result, seroma, undulations or bulging, compartment syndrome, panniculitis, transitory hypoesthesia, and embolism [10-12].

Filling with PMMA presents lower risks because it is a minimally invasive procedure. It presents satisfactory results, as it allows volume to be added in stages until the correction of the aesthetic complaint is achieved, and it can be used in the doctor's office, with predictable and long-lasting results [12].

The product for aesthetic use is composed of PMMA microspheres suspended in an aqueous gel vehicle. Once injected, the vehicle is rapidly absorbed, leading to the expected innate foreign-body immune reaction. Macrophages adhere to the microspheres and recruit fibroblasts that will produce collagen enveloping the particles. This reaction fixes the material in the implanted place and is responsible for the volume increase in the region. Therefore, there will be neocollagen tissue between muscle bundles, in the perimysium, serving as a foundation for muscle fibers and increasing the volume of the muscle [7,13]. The

results of the treatment are immediate and lasting, related to the nonabsorbable particles of the product [5,8,13].

It is worth noting that the application of more PMMA volume in subsequent sessions should consider the patient's desire, symmetry, and especially the volumetric capacity of the muscle and adjacent anatomical structures. A careful medical evaluation and planning of the procedure in stages is fundamental to avoid compartment syndrome, which is a great risk in calf filling [14].

The result obtained with the intramuscular filling was effective in treating calf muscle asymmetry, with an increase of 7cm in the left calf circumference after the end of treatment. Besides, the patient did not present any complications during the process; therefore, it was considered a safe treatment.

Conclusion

The result obtained with the intramuscular filling was effective in treating calf muscle asymmetry.

Acknowledgement

Not applicable.

Ethical Approval

The study was approved by the Ethics Committee for Human Research - Uniavan University Center – Balneário Camboriú, Santa Catarina, Brazil - under opinion number 5.740.799.

Informed consent

The consent form was applied.

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Data sharing statement

No additional data are available.

Conflict of interest

The authors declare no conflict of interest.

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References

1. Agüero AL. Poliomyelitis en Argentina: epidemias, políticas sanitarias, tratamientos e instituciones. *Rev Argent Salud Pública*. 2020 Dec 10; 12:21-21.
2. Ploeger HE, Bus SA, Brehm MA, Nollet F. Use and usability of custom-made dorsiflexion-restricting ankle-foot orthoses for calf muscle weakness in polio survivors: a cross-sectional survey. *Eur J Phys Rehabil Med*. 2020 May 26; 56(5):575-584. doi: <https://doi.org/10.23736/S1973-9087.20.06020-7>.
3. Kay L, Nielsen NM, Wanscher B, Jennum P. Neurological Symptoms in Danes with a History of Poliomyelitis: Lifelong Follow-Up of Late Symptoms, their Association with Initial Symptoms of Polio, and Presence of Postpolio Syndrome. *Eur Neurol*. 2018; 80(5-6):295-303. doi: <https://doi.org/10.1159/000497483>.
4. Lo JK, Robinson LR. Postpolio syndrome and the late effects of poliomyelitis. Part 1. pathogenesis, biomechanical considerations, diagnosis, and investigations. *Muscle Nerve*. 2018 Dec; 58(6):751-759. doi: <https://doi.org/10.1002/mus.26168>.
5. Bortolozo F, Menezes HS, Paschoal Ângela S, Rinaldi M, Rêgo B, Souza P. Scanning electron microscope analysis of PMMA third generation: a comparative experimental study. *MedNEXT Journal of Medical and Health Sciences*. 2022 May 27. 3(2). doi: <https://doi.org/10.54448/mdnt22208>.
6. Bortolozo F, Azizi PCA, Teixeira EC, Rinaldi M, Paschoal Ângela S, Menezes HS, et al. Polymethylmethacrylate injections for augmentation and strengthening of abdominal muscles: an experimental model. *MedNEXT Journal of Medical and Health Sciences*. 2023 May 3;4(2). doi: <https://doi.org/10.54448/mdnt23209>.
7. Chacur R, Sampaio Menezes H, Maria Bordin da Silva Chacur N, Dias Alves D, Cadore Mafaldo R, Dias Gomes L, et al. Gluteal Augmentation with Polymethyl Methacrylate: A 10-year Cohort Study. *Plast Reconstr Surg Glob Open*. 2019 May 31;7(5):e2193. doi: <https://doi.org/10.1097/GOX.0000000000002193>.
8. Teixeira EC, Bortolozo F, Menezes, HS. Biocompatibility and fibrous response of polymethylmethacrylate in skeletal muscles. *International Journal of Development Research*. 2021 Oct 30; 11(10), 51034-51039.
9. Lo JK, Robinson LR. Post-polio syndrome and the

- late effects of poliomyelitis: Part 2. treatment, management, and prognosis. *Muscle Nerve*. 2018 Dec; 58(6):760-769. doi: <https://doi.org/10.1002/mus.26167>.
10. Melita D, Innocenti A. surgical calf augmentation techniques: personal experience, literature review and analysis of complications. *Aesthetic Plast Surg*. 2019 Aug;43(4):973-979. doi: <https://doi.org/10.1007/s00266-01901347-z>.
11. Andjelkov K, Atanasijevic TC, Popovic VM, Colic M, Llull R. Safe composite calf augmentation: a staged procedure. *Aesthet Surg J*. 2021 Jan 25;41(2):NP26NP35. doi: <https://doi.org/10.1093/asj/sjaa080>.
12. Paulucci BP. PMMA safety for facial filling: review of rates of granuloma occurrence and treatment methods. *Aesthetic Plast Surg*. 2020 Feb;44(1):148159. doi: <https://doi.org/10.1007/s00266-019-01522-2>.
13. Ronan SJ, Eaton L, Lehman A, Pilcher B, Erickson CP. Histologic Characterization of Polymethylmethacrylate Dermal Filler Biostimulatory Properties in Human Skin. *Dermatol Surg*. 2019 Dec;45(12):1580-1584. doi: <https://doi.org/10.1097/DSS.0000000000001877>
14. Teixeira ACA, Dib CC. Implantes de panturrilha: complicações, prevenção e tratamento. *Rev. Bras. Cir. Plást*. 2010 Sep; 25: 547-550. doi: <https://doi.org/10.1590/S1983-51752010000300024>.