Penile Girth Enhancement With Polymethylmethacrylate-Based Soft Tissue Fillers

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Penile Girth Enhancement With Polymethylmethacrylate-Based Soft Tissue Fillers

Luis Casavantes, MD,[1] Gottfried Lemperle, MD, PhD,[2] and Palmira Morales, MD[1]

ABSTRACT

Introduction: An unknown percentage of men will take every risk to develop a larger penis. Thus far, most injectables have caused serious problems. Polymethylmethacrylate (PMMA) microspheres have been injected as a wrinkle filler and volumizer with increasing safety since 1989.

Aim: To report on a safe and permanently effective method to enhance penile girth and length with an approved dermal filler (ie, PMMA).

Methods: Since 2007, the senior author has performed penile augmentation in 752 men mainly with Metacrill, a suspension of PMMA microspheres in carboxymethyl-cellulose.

Main Outcome Measures: The data of 729 patients and 203 completed questionnaires were evaluated statistically.

Results: The overall satisfaction rate was 8.7 on a scale of 1 to 10. After one to three injection sessions, average girth increased by 3.5 cm, or 134% (10.2 to 13.7 cm = 134.31%). Penile length also increased by weight and stretching force of the implant from an average of 9.8 to 10.5 cm. Approximately half the patients perceived some irregularities of the implant, which caused no problems. Complications occurred in 0.4%, when PMMA nodules had to be surgically removed in three of the 24% of patients who had a non-circumcised penis.

Conclusion: After 5 years of development, penile augmentation with PMMA microspheres appears to be a natural, safe, and permanently effective method. The only complication of nodule formation and other irregularities can be overcome by an improved injection technique and better postimplantation care.

Key Words: Polymethylmethacrylate Injections; Girth Enhancement; Penile Enlargement; Penile Injection Technique; Dermal Filler for Penile Injection

INTRODUCTION

"Bigger is better" sticks in the heads of many men worldwide,[1–3] although women feel more excitement if their vagina is optimally stretched.[4,5] Because the main nerve supply of the vagina is found in its lower third,[6–8] the length of a penis appears to matter less than girth during intercourse.

Because a large percentage of men are not satisfied with the size of their penis,[1–3] the demand to increase it is high and has led to many attempts using all kinds of injectables, including mineral oils, paraffin, fluid silicone, and polyacrylamide.[9–11]

Autologous fat injections are widely used,[12] although the key for a predictable "take" has not been established. Absorption, oily cysts, irregularities, and non-predictable results continue to be common side effects. In addition, commercial products of slowly absorbable dermal acellular grafts (AlloDerm, Acelity, San Antonio, TX, USA)[13] often have to be removed because of infection and folding,[14] and the manufacturer does not recommend them for girth enhancement. Similar problems have occurred after implantation of a solid silicone 3/4 tube.[15]

Few methods are successful with long-term effectiveness. One method, a vascularized dermis-fat flap, uses the superficial circumflex iliac artery and vein from the groin implanted between the penile skin and corpora.[16]

Some widely used dermal fillers, such as cross-linked hyaluronic acids, have been successfully injected to increase girth for up to 1 year 6 months.[17–20]

Non-absorbable soft tissue fillers have become more and more popular,[18] and more body areas are being altered as patients

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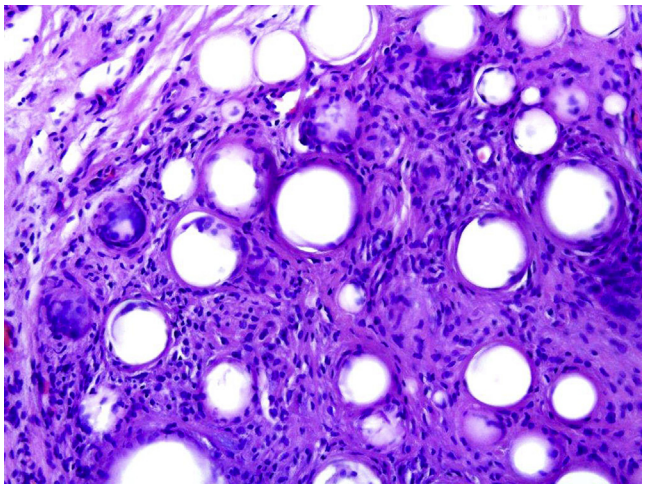

Figure 1. Polymethylmethacrylate microspheres after 3 months are surrounded by granulation tissue.

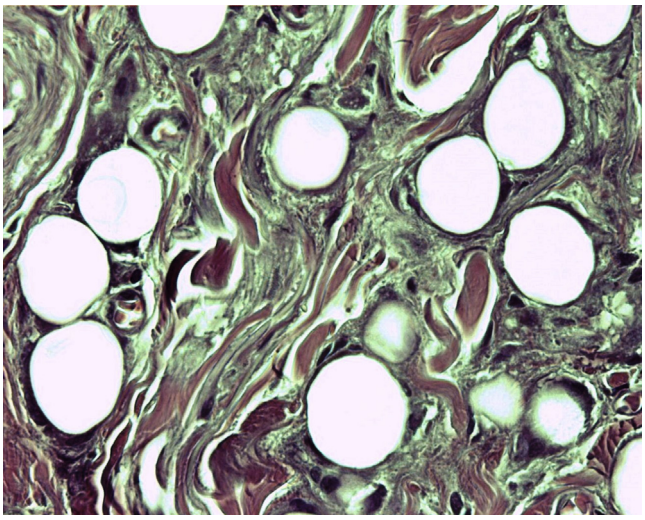

Figure 2. At 10 years, the microspheres are embedded in collagen fibers and capillaries, which converted the polymethylmethacrylate implant to "living tissue."

widen the requests for trendier looks and attributes. One of the safest non-absorbable soft tissue fillers is comprised of microspheres of polymethylmethacrylate (PMMA) suspended in vehicles such as bovine collagen or cellulose.[21]

After injection into the body, individual microspheres become encapsulated with granulation tissue, which is followed by the ingrowth of blood vessels, eventually creating a "living tissue" (Figures 1 and 2). Similar fillers have been used as "volumizing agents" in Europe and the United States for facial augmentation[21,22] and in Brazil for muscle augmentation since 1998.[23,24]

The purpose of this study is to report the safety and efficacy of PMMA microspheres suspended in carboxymethyl-cellulose (Metacrill, Nutricel, Guapimirim, Rio de Janeiro, Brazil) for cosmetic or corrective girth enhancement of the penile shaft.

METHODS

Patients

The study included 729 men treated with an estimated 1,500 sessions of penile girth enhancement with PMMA microsphere injections from September 1, 2007 to February 15, 2015. Patients were healthy men with an average age of 37 years (range = 19–68). Seventy-six percent were circumcised, 94% were looking for cosmetic enhancement, and 6% were seeking correction after other surgical procedures or trauma. Patients came from all over the world with a strong desire to change the diameter of their penis; 64% were Caucasian, 16% were Latino, 9% were African American, 4% were Asian, and 7% were of other races. They were dissatisfied with the average penile dimensions found in the literature (flaccid length = 9.2 cm, erect length = 13.1 cm, flaccid girth = 9.3 cm, erect girth = 11.7 cm).[3]

Statistics

Questionnaires with 20 questions about sensitivity, sexual function, adverse events, and satisfaction were sent to all 729 patients; the answers of 203 patients could be evaluated (return rate = 27.8%). Pre- and post-treatment girth measurements of the 203 patients were compared using a paired *t*-test in SPSS (SPSS, Inc, Chicago, IL, USA) and descriptive statistics (eg, mean and SD) were calculated. Comparisons were performed for each session. The mean difference between the pre- and post-treatment groups was calculated as −2.2192 (SD = 1.1615) with a *P* value less than .001 for all measurements.

Product

The injected product was Metacrill, which is comprised of PMMA microspheres suspended in a carboxy-methylcellulose gel. The approximate number of PMMA microspheres per milliliter is 3 million for Metacrill 10% and 9 million for Metacrill 30%.

Technique

Preparation

Girth enhancement with PMMA is an outpatient procedure performed under regional anesthesia. Patients were premedicated with lorazepam (Ativan; Pfizer, Mexico City, Mexico) 1 mg sublingually; all uncircumcised and selected circumcised patients received betamethasone (Diprospan; Schering-Plough, Xomchilco, Mexico) 1 mL by intramuscular injection to control swelling.

Markings

First, two ventral longitudinal lines were drawn immediately on both sides of the urethra to avoid injecting filler in this area (Figure 3). Second, two dorsal longitudinal lines were drawn on the sides of the shaft, from the base to the corona, followed by two to three transversal lines to demarcate 9 to 12 sections (Figure 4).

Local Anesthesia

After asepsis, local anesthesia was performed using circular plus ventral upward infiltration with lidocaine 2% without epinephrine at the penile root.[25]

Figure 3. The corpus spongiosum is marked with two lines. Figure 3 is available in color online at www.jsx.jsexmed.org.

Injection Technique

In the typical patient, nine sections and six entry points were used for a full treatment. Entry points were made with a sharp 16-gauge needle (Figure 5), which was used only to open the skin

Figure 4. Two longitudinal lines are drawn at the sides of the shaft followed by two transversal lines that demarcate nine sections for polymethylmethacrylate injection. Figure 4 is available in color online at www.jsx.jsexmed.org.

Figure 5. Entry points are marked alongside the longitudinal lines to reach all nine segments. Figure 5 is available in color online at www.jsx.jsexmed.org.

and allow the 22-gauge microcannula to travel into the gliding space. The entry points were located alongside the longitudinal lines, with one next to the proximal transversal line and the other two on each side of the distal transversal line.

PMMA microspheres were injected using disposable microcannulas (22-gauge × 50 mm or 22-gauge × 70 mm) with the orifice on the side of the tip facing down. A commercially available mechanically precise injection pistol (BioMedical, Porto Alegre, Brazil) ensured standard volume deposits of 0.1 mL (Figure 6). The senior author has presented this technique in medical meetings under the name Exact Implantation Technology (EIT). Using the EIT, the Buck fascia is easily identified, and the PMMA suspension is deposited overlying the Buck fascia at the level of the deep Dartos fascia.

The PMMA suspension injected overlying the Buck fascia leaves the superficial Dartos fascia untouched, and the alveolar gliding space is preserved, maintaining the gliding of the skin over the implant or of the implant over the Buck fascia. The implants were positioned in direction of the base and the corona, in individual drops, slightly overlapping but avoiding ridges.

Most treatments were performed using manual traction with the penis in relaxation; induced erection was tried but manipulating a tumescent penis was more difficult and the clinical results were similar with the two variations.

As the PMMA injection was being performed, massage with firm pressure was applied to distribute the product to the desired areas. Patients were carefully instructed to continue the massage on their own and were seen 24 hours later to make sure they were following the instructions as indicated. Patients continued the massage and manipulation for as long as 72 hours. In addition, some patients used a metal or hard rubber roller to even out the implanted PMMA.[17] All patients were prescribed with antibiotics and a penile extensor (ESL-40) was prescribed for patients with severe retraction.

Figure 6. Injection pistol ensured standard volume deposits of 0.1 mL. Figure 6 is available in color online at www.jsx.jsexmed.org.

Micropenis

A common criterion for a micropenis is a dorsal erect length shorter than 7 cm for an adult compared with an average erection length of 12.5 cm. In the sample of 729 patients, 13 patients (1.8%) had a micropenis. To maintain a normal girth-length ratio, these patients are treated with less product, a lower concentration, smaller microcannulas, and fewer sessions using only two to four entry points.

Peyronie Disease

PMMA implants can be individualized to partly or fully balance the shaft of the penis in the presence of curvatures. Minor deformities or curvatures associated with Peyronie disease can be corrected by volume compensation on the concave side. Good results were obtained in two patients (0.3%) with mild Peyronie disease.[26] The same principle is used to correct unusual shapes, such as "missile" penis, "hourglass" penis, thin base, etc, by injecting PMMA in areas that lack volume.

All treatments were performed as outpatient procedures under local anesthesia at Avanti Derma (Tijuana, Mexico).

RESULTS

Clinical Outcome

Once implanted, the water-based carrier (70—90% of the volume) is absorbed and metabolized by the body, causing partial loss of the initial volume. The lost volume will be regained slowly but steadily as the connective tissue surrounds each PMMA microsphere within 2 to 3 months. In all patients, the PMMA implant was fixed to the Buck fascia and the penile skin was moved over the implant or the implant was in the deep Dartos fascia and moved over the Buck fascia. The surface was absolutely smooth in approximately 50% of patients. In the other half, one could sense or observe irregularities of the surface, which typically was no problem for most patients. Otherwise, they came for a touch-up session to smoothen the surface with PMMA 10%.

Injected Volumes

Patients were required to have a minimum of two sessions and a maximum of three performed approximately every 6 weeks. Thirty-three percent of patients returned for the second follow-up sessions, 16% for a third, 6% for a fourth, and 3% for a fifth. Third and fourth sessions were mostly "touch-up" sessions to correct minor deficits using small volumes of PMMA.

Most patients received PMMA 10% in the three distal (neck) segments and PMMA 30% in the mid-shaft and base. Injected volumes varied among individuals for anatomic reasons and patients' expectations. The average total volume used in the first session was 20 mL, of which half consisted of a 30% concentration and the other half consisted of 10% and 20% concentrations. The 20% PMMA suspension was produced in sterile fashion in a 2-mL syringe using a female-to-female connector between a 10% and a 30% PMMA syringe. The average total volume was 40 mL (range = 140 mL in one patient to 5 mL in another patient).

Penile Measurements

In-office measurements showed a mean increase in girth of 2.4 cm ($P < .001$) from 10.4 to 12.8 cm for the mid-shaft of the flaccid penis (Table 1), and patients' self-assessment showed an average girth increase of 2.5 cm ($P < .001$) during relaxation and 2.3 cm ($P < .001$) in full erection.

In-office measurements showed an average increase in flaccid penile length of 0.7 cm from 9.8 to 10.5 cm, which could be attributed to the rather stiff implant that surrounds the corpora and prevents total shrinking in a flaccid stage, even under stress, cold weather, or cold water.

Table 1. Penile flaccid girth increase after several polymethylmethacrylate injections*

	n	Minimum	Maximum	Mean	SD	Significance
Mid-shaft before	203	6.5	16.0	10.542	1.4907	
Mid-shaft after	203	8.5	17.0	12.761	1.4145	$P < .001$
Penile base before	203	7.0	16.5	10.719	1.4700	
Penile base after	203	9.0	18.0	13.007	1.4679	$P < .001$
Penile neck before	203	7.0	15.0	10.207	1.3703	
Penile neck after	203	8.0	24.5	12.254	1.5916	$P < .001$

*Two examples of the smallest and largest treated penises and the mean in 203 evaluated patients.

Patients With Previous Procedures

Circumcision

Irregularities are more common in uncircumcised patients who need a more conservative approach (smaller volume of filler and fewer sessions); their skin is loose and the foreskin has to be preserved intact. The neck has to be approached with the foreskin under full retraction and the mid-shaft and base with the foreskin fully extended; the continuation between the two areas often results in an overlap that leads to nodules owing to excess or to deficits owing to lack of product. In contrast, circumcised patients are better candidates because they have tighter skin that helps keep the suspension in place during the initial phase, and the entire shaft is one single area of implant. A common complication in circumcised patients is the development of a tight ring at the circumcision scar, leaving an initial crease that needs to be corrected in a future session, once the implant is settled.

Soft Silicone Penile Implants

Seventeen of the 729 patients (2.3%) had a permanent implant[15] removed before their treatment with PMMA. All had developed fibrosis after extraction; one had lost at least 2 inches in length with a severe "accordion" effect.

Suspensory Ligament Release

Girth enhancement with PMMA is compatible with surgical penile lengthening through suspensory ligament release whether the injections are performed before surgery or after the area is fully healed. The PMMA implant in these patients has the same effect as in non-operated patients, but based on statistical data,[27] we do not recommend this surgery to our patients, because some have no results or develop paradoxical shortening. Furthermore, the satisfaction rate of 35% led to the conclusion that this "virtual" lengthening should be used as a last resort and stretching devices should be used instead.[27]

Inflatable Penile Prosthesis

For one reason or another, a penis with an internal prosthesis, rigid or inflatable, loses some length by internal scar tissue and loses girth over time.[28] Three patients with internal prostheses were fully satisfied with their girth enhancement with PMMA.

Autologous Fat Transfer

Nine of the 729 patients (1.2%) underwent fat transfer that left irregularities[12] but also made the tissues firmer, facilitating the implantation of PMMA.

Regenerative Tissue Matrix (AlloDerm)

Ten patients (1.4%) previously received regenerative tissue matrix implants[14] that were totally or partly dissolved at the time of the PMMA implantation. This implant made the tissues firmer, facilitating the implantation of PMMA.

Figure 7. Common irregularities of nodules and voids.

Complications

Postoperative swelling and internal inflammation resolved within a few days. None of the patients' sexual partners expressed any concern or discomfort with this initial "soft" step. Because the PMMA implant does not cover the urethral part of the corpus spongiosum, no lower urinary symptoms were seen.

Irregularities

The penis is the only area of the human body that does not have a layer of subcutaneous adipose tissue that could help camouflage the implant, and irregularities such as nodules and voids are easily detectable even with the use of a small volume. More half the patients (52%) reported minimum to severe irregularities such as single nodules (Figure 7), multiple nodules, hard ridges at the circumcision scar or at the base, micro-nodules at the entry points, indentations, or voids. The incidence of irregularities was higher owing to the inclusion of numerous (22%) non-circumcised patients whose penile skin is longer and looser. Three patients (0.4%) had one PMMA nodule surgically removed with no further complications.

Granulomas

Inactive nodules were often confused with granulomas by patients and some physicians, but no true granulomas were documented. Granulomas can occur after injections of fillers into

Figure 8. Circumcised patient before and 3 months after one session with polymethylmethacrylate 20 mL.

the dermis but not into deeper spaces (epi-periosteal) or the areolar space between the Buck and Dartos fasciae with lesser immunologic activity.[21]

Migration

No instances of PMMA translocation or migrating of PMMA microspheres to neighboring areas were seen.

Exudate Through the Entry Points

Sterile exudate through the entry points is a common occurrence that resolves in approximately 24 hours. Two patients (0.3%) presented exudate that lasted longer than 72 hours but resolved with no further complications.

Removal of PMMA Penile Implants

Total surgical removal of a PMMA implant might require aggressive degloving of the penis, which is associated with painful recovery and permanent irregularities. Removal should be the last option, and meticulous smoothening of irregularities with cross-linked hyaluronic acid,[17] Silikon 1000, silicone micro-droplets, or PMMA is more advisable.

Patient Satisfaction

All 729 patients included in this study received a questionnaire to assess long-term safety and satisfaction for up to 7 years; however, only 203 patients (28%) returned this questionnaire. We could not find any obvious dissatisfaction in our notes of the remaining non-responders. Patient satisfaction was measured on a scale of 1 (very dissatisfied) to 10 (extremely satisfied; Figures 8–10).

Overall satisfaction with the procedure was 8.7 on a scale of 1 to 10. Of the 203 patients, 168 were satisfied (83%; score = 8–10), 25 were not satisfied (12%; score = 6 and 7), and 10 were dissatisfied (5%; score < 5).

Sexual Function

Because the PMMA implant is independent of the corpora cavernosa and the corpus spongiosum, erectile function is not affected. The survey of 203 patients showed that erectile function was unaltered in 83%, enhanced in 15%, and decreased in 1.5%. The sensitivity of the penis was unaltered in 83%, enhanced in 15%, and decreased in 2%.

Because the pudendal dorsal nerve endings running in the Buck fascia are covered with the PMMA implant, we expected some changes, such as delayed orgasms, but such an effect was not reported by any patient.

DISCUSSION

Although penile augmentation is under-reported in the literature, public interest in such procedures is increasing. The growing demand for such procedures requires an honest and meticulous long-term evaluation of the injected materials and clear documentation of a patient's satisfaction and complaints.

The most common reason for girth enhancement is, whether subjective or not, a small penis; some expect an enhancement of their sexual life with their partners and a small percentage recognize that it is for their own gratification and self-esteem. In addition to different hyaluronic acid fillers with a limited longevity of 6 to 18 months,[17–20]

Figure 9. Uncircumcised patient before and 11 months after one session with polymethylmethacrylate 22 mL.

modern PMMA microspheres are as safe, with the immense advantage of a lifetime effect. Increasing expertise and injection skills have decreased serious implant irregularities to an acceptable level.

PMMA microsphere injections for facial wrinkles have been used since 1989,[21] with varying success and some complications typical for all dermal fillers.[29,30] Foreign body granulomas have been largely prevented by injecting deep to the bone and

Figure 10. Corrective treatments. Left panel shows deformity. Middle panel shows retraction after removal of the solid silicone implant. Right panel shows a penis after several sessions of polymethylmethacrylate injections.

beneath the fatty layer of the skin, where immunologic sensitization is much less pronounced than in the dermis.[21] In the total series of 729 patients, we found no late foreign body granulomas.

Metacrill is approved in Brazil, Mexico, and Europe, and ArteFill (Bellafill since 2015; Suneva Medical, Santa Barbara, CA, USA) is approved by the U.S. Food and Drug Administration in the United States and South Korea, but the latter product is too expensive when considering an average volume of PMMA 40 mL per patient. The same is true for Artecoll (Artes Medical, San Diego, CA, USA), which is approved in Europe by the Conformité Européenne and in China by the Chinese Food and Drug Administration; PMMA microspheres in these products are suspended in rather expensive bovine collagen. Therefore, for larger volumes, we rely on the two affordable PMMA products (Metacrill and Linnea Safe [formerly New Plastic; BioMedical, Sao Paulo, Brazil]) approved by ANVISA, the Brazilian Health Ministry.

CONCLUSION

There is no perfect penile implant, but PMMA microspheres seem to be safe, stable, and efficient. The level of patient satisfaction is very high. Because penile PMMA implants are fairly new, most patients worry about possible future complications, but based on the wide experience of facial PMMA microsphere injections,[21] the future of penile implantations is promising, with the expectation of a life-long effect that will be stable and safe. What we are witnessing is a shift to a wider use of injectable implants and techniques designed specifically for penile girth enhancement.

TAKE HOME MESSAGE

The retrospective evaluation of 729 patients who underwent girth augmentation with a permanent dermal filler (PMMA microspheres) showed an average increase in girth of 2.4 cm and an overall satisfaction rate of 8.7 on a scale of 1 to 10.

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