Comparison of the Supporting Strength of a Poly-L-Lactic Acid Sheet and Porous Polyethylene (Medpor) for the Reconstruction of Orbital Floor Fractures

Kun Hwang, MD, PhD, and Dong Hyun Kim, MD, MS†*

Abstract: The aim of this study was to elucidate the supporting strength of the curved poly-L-lactic acid (PLLA) sheet and porous polyethylene (Medpor) for reconstruction of orbital floor fractures.

For one-half and two-thirds orbital floor fractures, reconstruction was performed using the PLLA sheet and Medpor. The PLLA sheet was molded to fit the orbital floor (concavity). The anterior portion (1 cm) was curved to fit the inferior orbital rim and fixed with a screw. Medpor was designed to fit the orbital floor. A screw was fixed 6 mm away from the anterior border of the orbital floor. Each implant was hung by wire, and the degree of sagging of the implant was measured using micrometers by the power of a force gauge. For one-half orbital floor fractures, the power of the PLLA sheet to sag 5 mm was 2.46 (SD, 0.14) N, and that of Medpor was 0.59 (SD, 0.04) N. The power of the PLLA sheet to sag 10 mm was 6.9 (SD, 0.14) N, and that of Medpor was 1.52 (SD, 0.16) N. For two-thirds orbital floor fractures, the power of the PLLA sheet to sag 5 mm was 1.79 (SD, 0.24) N, and that of Medpor was 0.39 (SD, 0.04) N. For 10 mm of sagging, the power of the PLLA sheet was 5.61 (SD, 0.29) N, and that of Medpor was 0.94 (SD, 0.09) N. For sagging of 15 mm, the power of the PLLA sheet was 8.99 (SD, 0.16) N, and that of Medpor was 2.98 (SD, 0.24) N. The PLLA sheet was irreversibly bent when the force reached ~8 to 9 N. For Medpor, the degree of sagging during the early stage was larger than at the later stage. In all situations, the supporting power of the PLLA sheet was greater than that of Medpor. The differences were significant in all situations ($P = 0.000$). The degree of sagging in one-half orbital floor fractures was 2.87 mm for the PLLA sheet and 7.96 mm for Medpor. There was an increased orbital volume of 0.4 mL with the PLLA sheet and 1.19 mL for Medpor. The predicted enophthalmos was 0.41 mm with the PLLA sheet and 1.07 mm with Medpor. The degree of sagging for the two-thirds orbital floor fractures was 4.28 mm for the PLLA sheet and 11.47 mm for Medpor. The increased orbital volume was 0.78 mL for the PLLA sheet and 2.22 mL for Medpor. The predicted enophthalmos was 0.73 mm with the PLLA sheet and 1.93 mm with Medpor. The predicted enophthalmos was below 2 mm with both the PLLA sheet and Medpor for reconstruction of orbital floor fractures; however, it was near 2 mm with Medpor in reconstruction of two-thirds orbital floor fractures.

The results of this study show that the PLLA sheet and Medpor were sufficient for reconstruction of one-half and two-thirds orbital floor fractures with a defective posterior part. However, the supporting power of the PLLA sheet was stronger than that of Medpor.

Key Words: Orbital fracture, biodegradable implant, poly-L-lactic acid, polyethylenes

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The primary objective of surgical reconstruction of orbital floor fractures is achieved by release of entrapped soft-tissue contents and by bridging the defect with autogenous or alloplastic material. Implants include both autogenous bone and alloplastic materials. Autogenous bone includes calvaria, the anterior wall of the maxillary sinus, and iliac bone. Alloplastic implants include the meshed titanium plate, poly-L-lactic acid (PLLA), porous polyethylene, hydroxyapatite, and Teflon.[1–5] In the past, bone grafts were commonly used, but recently, alloplastic implants, especially PLLA and Medpor (Porex Surgical, Newnan, GA), have been more widely used.[1–5] The surgical techniques involve returning the herniated orbital contents back into the maxillary sinus and placement of the implant over the orbital floor defect, overlapping the margins of the residual stable orbital floor. Reconstruction of an orbital floor defect of the posterior part is difficult. Alloplastic implants sag into the maxillary sinus with defects in the posterior part supporting the implant. For patients with a defect in the posterior part, autogenous bone grafting is the preferred technique.

Sagging of the implant into maxillary sinus can be prevented by fixing the implant to the inferior orbital rim or orbital floor even in cases with a posterior-part defect. Fixation of the implant to the inferior orbital rim prevents the implant from sagging into the maxillary sinus. Although numerous investigations and case reports have explored the technical aspects of the PLLA sheet, none has reported on fixation of a curved PLLA sheet to the inferior orbital wall for reconstruction of a large orbital floor fracture defect in the posterior part.

The goal of this study was to determine the supporting strength of the curved PLLA sheet and Medpor for reconstruction of orbital floor fractures.

MATERIALS AND METHODS

Design of the Orbital Floor Fracture

Intaglio of cadaveric right orbital floor was constructed with gypsum (Samwoo Co, Ulsan, Korea). Gypsum (Maruishi Co, Osaka,

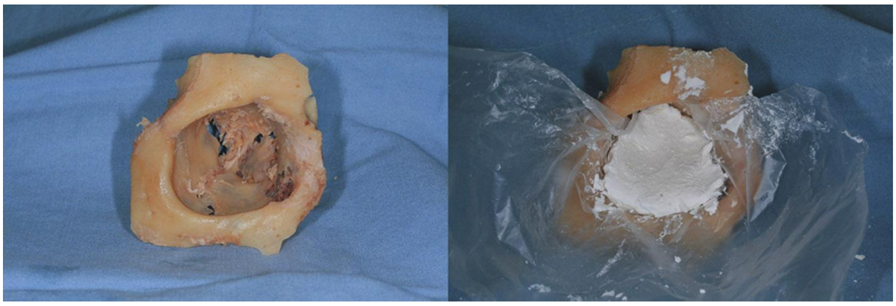

FIGURE 1. Design of the model of orbital floor fractures. The orbit was removed from a human skull. Gypsum (Samwoo Co) was used to construct a model of the human orbital floor. Left, Bony orbit. Right, Modeling pattern.

Japan) was used to make the relief after coating the intaglio with soapy water. This relief was the same shape as the orbital floor of the cadaver. The model was designed to represent orbital floor fractures involving posterior-part defects (Figs. 1 and 2): for one-half orbital floor fractures, the posterior one half of gypsum was removed. For two-thirds orbital floor fractures, the posterior two thirds of gypsum was removed.

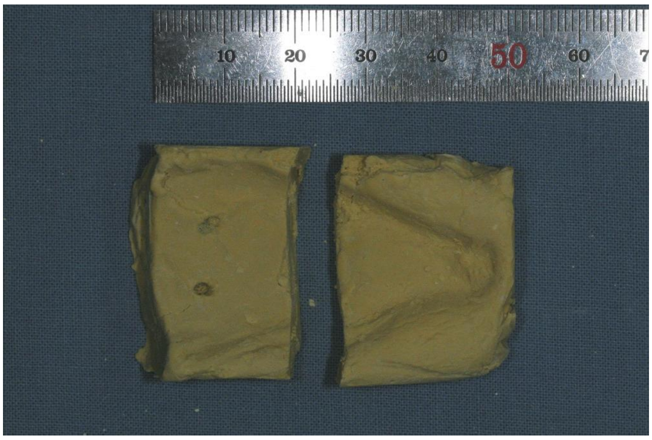

FIGURE 2. Model of orbital floor fractures. Molded gypsum (Maruishi Co) was divided along the orbital coronal axis. For one-half orbital fractures, half of the gypsum was divided.

Design of the Reconstruction of the Orbital Floor Fracture

The PLLA sheet (0.5-mm thickness; Inion Co, Tampere, Finland) was molded to fit the orbital floor. An additional 1 cm was reserved for fixation to the inferior orbital rim. The PLLA sheet was heated at 60°C and bent to fit the inferior orbital rim and then fixed with four 8-mm screws. The screws were fixed 6 mm apart from the inferior orbital rim inferiorly and at 6-mm intervals from each another (Figs. 3 and 4).

The force gauge and PLLA sheet were linked with a 4-0 wire. The gypsum was stably fixed to the table, and another end of the wire was linked with the force gauge.

For Medpor (0.85-mm thickness), the procedures were performed the same as for the PLLA sheet except for the location of fixation (7 mm apart from inferior orbital rim posteriorly and at

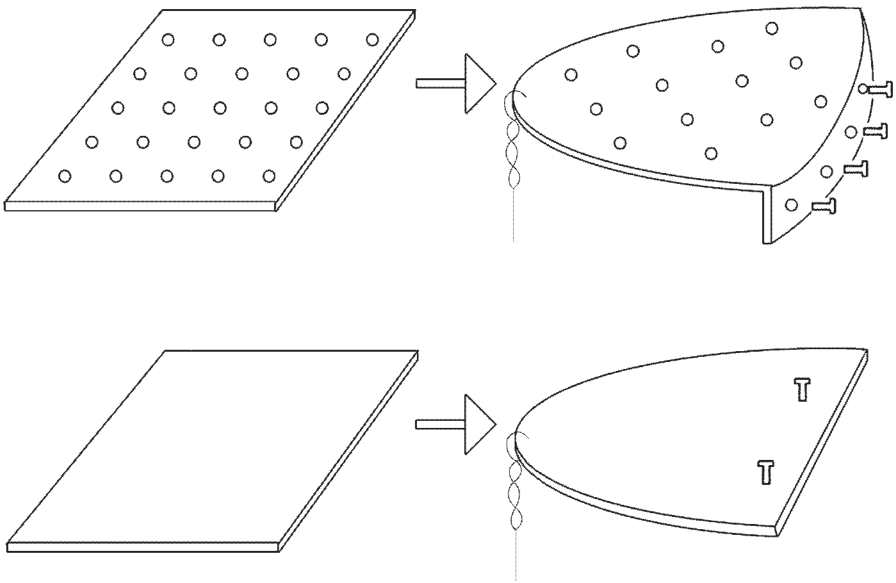

FIGURE 3. Sculpture of PLLA sheet and Medpor (porous polyethylene). Above, the PLLA sheet was molded to fit the orbital floor (concavity). The anterior portion (1 cm) was curved to fit the inferior orbital rim. Through the pore of the curved area, a screw was fixed. Below, Medpor. Medpor was designed to fit the orbital floor. A screw was fixed at 6 mm from the anterior border of the orbital floor.

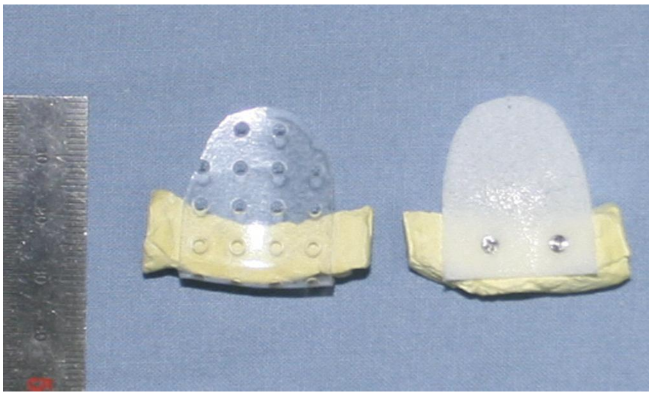

FIGURE 4. The PLLA sheet was fixed to the gypsum with a screw in the inferior orbital rim of the two-thirds orbital floor fracture. Medpor (porous polyethylene) sheet was fixed to gypsum with a screw in the two-thirds orbital floor fracture. Left, PLLA sheet. Right, Medpor.

11-mm intervals from each other)[5]; the 4-0 wire was fixed to at 2 mm apart from the posterior tip of Medpor (Fig. 5).

Measurement of Sagging Degree and Force Applied

A force gauge (model BFG 200 N; Mecmesin, Slinfold, UK) and micrometer that could measure up to 1/100 mm were prepared. The screw was welded and fixed between the measuring arms. The distance between the measuring arms changed in accordance with the rotation of the screw (increase in left-sided rotation, decrease in right-sided rotation). The measuring arms and posterior wall of the force gauge were welded and fixed (Fig. 6). The force gauge moved up and down along the measuring arms. The degree of sagging and the force were measured. The measurements of the force gauge represented the degree of sagging of the implants, and the measurements of the force gauge represented the force applied to the implants.

Measurement of Increased Orbital Volume

Increased orbital volume was measured using a melted candle using rubber clay (Fig. 7).

Statistics

The results are presented as mean (SD). Statistical significance was tested using the independent *t*-test. $P < 0.05$ was considered significant.

RESULTS

The PLLA sheet and Medpor began to sag as force was applied. The force applied to the PLLA sheet and Medpor was 2.46 (SD, 0.14) N and 0.59 (SD, 0.04) N each, respectively, for 5 mm of sagging, and 6.9 (SD, 0.14) N, 1.52 (SD, 0.16) N each, respectively, for 10 mm of sagging, in one-half orbital floor fractures (Table 1).

For the two-thirds orbital floor fractures, the forces applied to the PLLA sheet and Medpor were 1.79 (SD, 0.24) N and 0.39 (SD, 0.04) N each, respectively, for 5 mm of sagging, 5.61 (SD, 0.29) N and 0.94 (SD, 0.09) N each for 10 mm of sagging, and 8.99 (SD, 0.16) N and 2.98 (SD, 0.24) N each, respectively, for 5 mm of sagging (Table 2).

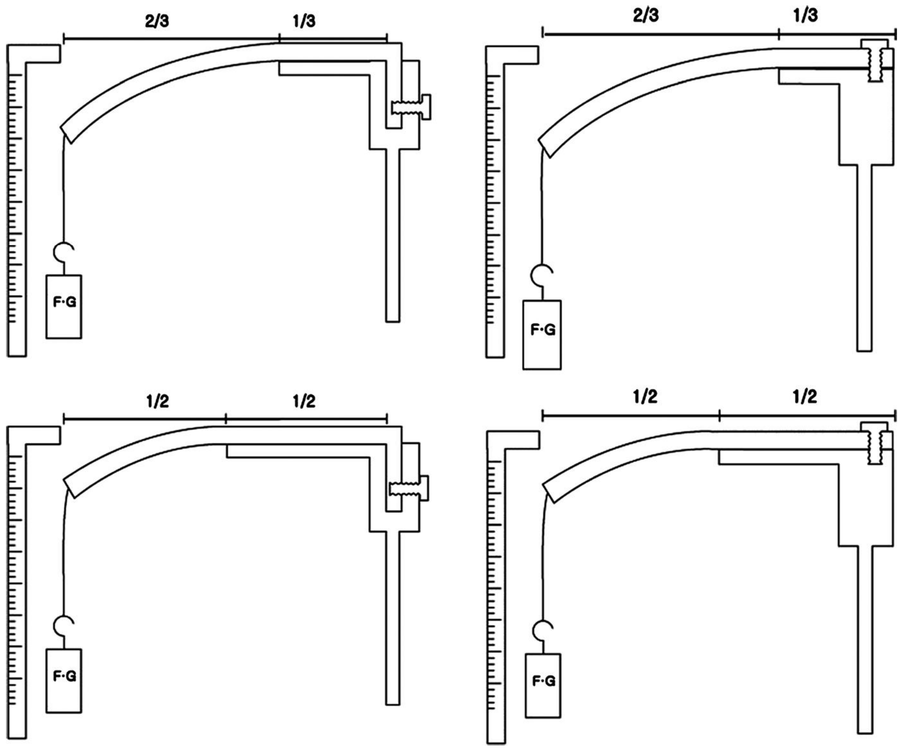

FIGURE 5. Application of the PLLA sheet and Medpor (porous polyethylene) for orbital floor reconstruction. The PLLA sheet was fixed to the gypsum. The force gauze and distal tip of the PLLA sheet were connected with a wire. The same procedure performed with the PLLA sheet was carried out with Medpor. The force was measured by a force gauge, and the degree of sagging was measured by a micrometer. Left upper, PLLA sheet for two-thirds orbital fracture. Right upper, Medpor for two-thirds orbital fracture. Left lower, PLLA sheet for one-half orbital fracture. Right lower, Medpor for one-half orbital fracture.

FIGURE 6. Design for a measuring tool for a force gauge fixed with a micrometer. A screw was welded between the arms of the micrometer. The micrometer and posterior side of the force gauge were welded. The force gauge was moved up and down along the screw. The force applied to the PLLA sheet or Medpor (porous polyethylene) was measured with the force gauge, and the degree of sagging was also measured with the micrometer. Left, Force and degree-of-sagging experiment. Right, Magnification of the model of the orbital floor reconstruction.

The supporting power of the PLLA sheet was significantly greater than that of Medpor (P = 0.000). In comparison with the force applied to the PLLA sheet with 5 mm of sagging, it was 2.46 (SD, 0.14) N with one-half fractures and 1.79 (SD, 0.24) N with two-thirds fractures. There was no significant difference between the fractures (P = 0.052). However, for the 10 mm of sagging, it was 6.9 (SD, 0.14) N for the one-half fractures and 5.61 (SD, 0.29) N for the two-thirds fractures. The supporting strength for the one-half fractures was significantly greater than for the two-thirds fractures (P = 0.007; Table 3).

In comparison with the force applied to Medpor with 5 mm of sagging, it was 0.59 (SD, 0.04) N for one-half fractures and 0.39 (SD, 0.04) N for two-thirds fractures (P = 0.008). For 10 mm of sagging, it was 1.52 (SD, 0.16) N for one-half fractures and 0.94 (SD, 0.09) N for two-thirds fractures (P = 0.017). In all cases, the supporting power for the two-thirds fractures was significantly greater than for the one-half fractures (Table 4).

TABLE 1. Comparison of the Supporting Strength of the PLLA Sheet and Medpor (Porous Polyethylene) for Orbital Floor Fractures (One-Half)

Orbital Floor Fracture (One-Half)	Force, N		
	PLLA Sheet	Medpor	*P*
5-mm sagging	2.46 (0.14)	0.59 (0.04)	0.000
10-mm sagging	6.9 (0.14)	1.52 (0.16)	0.000

The sagging degree of the implants was increased in accordance with the increase of the defect size. The sagging degrees of the PLLA sheet and Medpor were proportional to the force applied. The sagging degree of the PLLA sheet was increased in accordance with the increase in force and abruptly increased at ~8 to 9 N. The PLLA sheet was bent irreversibly above the supporting strength. For Medpor, the degree of sagging was increased in accordance with the increase in force similar to the PLLA sheet, but not abruptly. Instead, the degree of sagging during the early stages was larger than during later stages (Figs. 8 and 9).

For the two-thirds orbital floor fracture with 5-mm sagging, the increased orbital volume was 0.94 mL for the PLLA sheet and 1.04 mL for Medpor. For 10 mm of sagging, the increased orbital volume was 1.72 mL for the PLLA sheet and 1.96 mL for Medpor. For the one-half orbital floor fracture with 5 mm of sagging, the increased orbital volume was 0.66 mL for the PLLA sheet and 0.78 mL for Medpor. For 10 mm of sagging, the increased orbital volume was 1.32 mL with the PLLA sheet and 1.50 mL for Medpor (Fig. 10). A linear relationship was observed between the degree of sagging and increased orbital volume. The trend equation for reconstruction with the PLLA sheet for the two-thirds orbital floor fracture was $y = 0.165x + 0.0749$ and $y = 0.1847x + 0.0972$ for Medpor. The trend equation for reconstruction with the PLLA sheet for the one-half orbital floor fracture was $y = 0.1288x + 0.0283$ and $y = 0.1416x + 0.0678$ for Medpor (Table 5). The relationship between the increased orbital volume and the degree of enophthalmos was the following[6]:

$$E = 0.84V + 0.07$$

where E = enophthalmos (in millimeters), and V = fractured-site volume (in milliliters).

The degree of sagging increased the orbital volume and predicted enophthalmos in accordance with the force (Table 6).[7]

DISCUSSION

The orbital floor is one of the most frequently damaged parts of the maxillofacial skeleton from facial trauma. Orbital floor

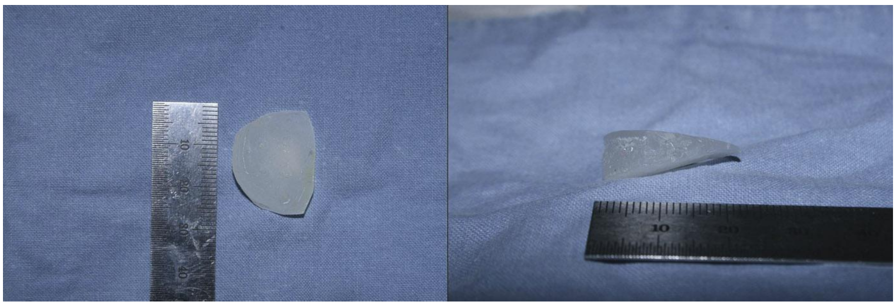

FIGURE 7. Increased orbital volume caused by sagging of the implant was measured using a melted candle.

TABLE 2. Comparison of the Supporting Strength of the PLLA Sheet and Medpor (Porous Polyethylene) for Orbital Floor Fractures (Two-Thirds)

Orbital Floor Fracture (Two-Thirds)	Force, N		
	PLLA Sheet	Medpor	*P*
5-mm sagging	1.79 (0.24)	0.39 (0.04)	0.000
10-mm sagging	5.61 (0.29)	0.94 (0.09)	0.000
15-mm sagging	8.99 (0.16)	2.98 (0.24)	0.000

fractures may cause functional and cosmetic problems such as residual dystopia, diplopia, and enophthalmos due to herniation of the orbital soft-tissue contents into the maxillary sinus together with extraocular muscle entrapment between bony fragments. The goal of treatment is to restore the convexity of the orbital floor and replace the herniated soft tissue with bone grafts or synthetic implants. Many types of implants have been used for the reconstruction of orbital floor fractures. The implants include both autogenous bone and alloplastic materials. A wide variety of other autogenous sources for orbital grafts have been described including calvaria, the anterior wall of the maxillary sinus, and iliac bone. Alloplastic materials used for repair of the orbital floor have included meshed titanium plates, porous polyethylene, hydroxyapatite, and Teflon. Autogenous bone grafts have been the preferred treatment because of resistance to infection. Another advantage of autogenous bone grafts is the optimal reconstruction of large orbital floor fractures with posterior defects that lack structural support. Disadvantages of the autogenous bone graft include nerve and blood vessel injuries, chronic donor-site pain, and cosmetic issues. In addition, fitting into the orbital floor defects is difficult, and resorption can occur. Alloplastic implants have many advantages: ease of use, elimination of donor-site morbidity, and reduced operation time. The complications associated with these implants include implant extrusion, orbital infection, fistula formation, implant migration, extraocular muscle entrapment, globe elevation, proptosis, and orbital cyst formation.

Currently, there is no sufficient bone structure to support implants for large defects of the orbital floor. In cases with defects of the posterior part, sagging of the implant or displacement into the maxillary sinus might occur. Therefore, to prevent these problems, more rigid materials are better suited for the reconstruction of large defects. Alloplastic materials are currently widely used, especially PLLA and Medpor.[1–5] The surgical techniques involve return of the herniated orbital contents into the maxillary sinus and placement of the implant over the orbital floor defect, overlapping the margins of the residual stable orbital floor. Medpor has an open-pore structure allowing vascularization as well as soft-tissue and bone ingrowth and is therefore resistant to infection. However, it is not resorbed, and therefore, the possibility of infection is still present. The main disadvantage of this porous polyethylene implant is the high rate

TABLE 3. Comparison of the Supporting Strength of the PLLA Sheet for One-Half and Two-Thirds Fractures

PLLA Sheet	Force, N		
	One-Half Fracture	Two-Thirds Fracture	*P*
5-mm sagging	2.46 (0.14)	1.79 (0.24)	0.052
10-mm sagging	6.9 (0.14)	5.61 (0.29)	0.007

TABLE 4. Comparison of the Supporting Strength of Medpor (Porous Polyethylene) for One-Half and Two-Thirds Fractures

Medpor	Force, N		
	One-Half Fracture	Two-Thirds Fracture	*P*
5-mm sagging	0.59 (0.04)	0.39 (0.04)	0.008
10-mm sagging	1.52 (0.16)	0.94 (0.09)	0.017

of infection before the implant is completely vascularized and becomes resistant to bacterial contamination.

The ideal implant material should have a high tensile strength and be easily handled, biocompatible, and resistant to infection.[8] Bioresorbable alloplastic materials have been gaining popularity for the reconstruction of orbital floor defects because of their ease of use and the absence of donor-site morbidity.

Internal orbital contents including the globe, extraocular musculature, orbital fat, neurovascular structures, the lacrimal apparatus, and even the musculocutaneous lids and weight have been reported to be 42.97 (SD, 4.05) g.[9] The normal direct orbital tension is 4 mm Hg, and the direct orbital tension after reconstruction of an orbital floor fracture is 9.3 (SD, 3.1 mm Hg).[7] The force applied to implants is calculated as the sum of the force caused by the internal orbital contents (0.4214 N: 9.8 m^2/s 0.043 kg) and by direct orbital tension after reconstruction of the orbital floor fracture.

$$760 \ \text{mm Hg}: \ 1.013 \ \text{kg/cm}^2 = \ 12.4 \ \text{mm Hg}: X$$

$$X = \ 0.017 \ \text{kg/cm}^2$$

$$\text{Force}: \ 9.8 \ \text{m}^2/\text{s} \quad 0.017 \ \text{kg/cm}^2 \quad \text{defect size } (\text{cm}^2)$$

The defect of the one-half orbital floor fractures was 3.72 cm^2 by planimetry. The force applied was 1.04 N. According to the findings of this study, this force could cause the PLLA sheet to sag 2.87 mm and Medpor to sag 7.96 mm. For the two-thirds defect of orbital floor fractures, it was 4.8 cm^2 by planimetry, and the force applied was 1.2211 N. This force could cause the PLLA sheet to sag 4.28 mm and Medpor to sag 11.47 mm. The predicted enophthalmos was below 1 mm for both the PLLA sheet and Medpor for reconstruction of the one-half orbital floor fractures. However, the predicted enophthalmos was near 2 mm (1.93 mm) for Medpor for reconstruction of two-thirds orbital floor fractures.

The degree of sagging of the implants was increased in accordance with the increase of the force applied. The degree of sagging of Medpor was greater than that of the PLLA sheet. Both the PLLA sheet and Medpor had enough strength for support because the expected enophthalmos was below 2 mm in all experiments. The expected enophthalmos for the PLLA sheet was smaller than that for Medpor. However, the PLLA sheet is preferred for the two-thirds orbital floor fractures, because the predicted enophthalmos with Medpor was near 2 mm (1.93 mm).

In a rabbit study,[10] parietal craniotomies were performed with repositioning and fixation of the bone flaps with a PLLA–polyglycolic acid copolymer. The histologic examination was performed at 2, 6, 9, and 12 months. After 2 months, the implant remained intact with no change. Six months postoperatively, a 66% reduction of surface size was found. Its initial boundaries were substituted by a connective tissue capsule. The implant underwent resorption, with a 99% volume loss and thin collagenous film remaining on the cranial bone surface by 9 months. By 12 months

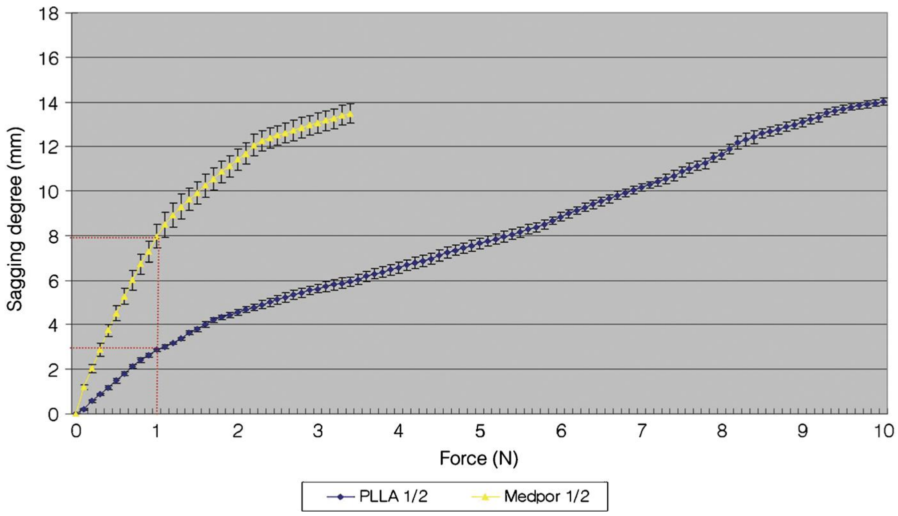

FIGURE 8. The degree of sagging of the implant and force of the orbital floor fracture (one-half). The slope of Medpor (porous polyethylene) was steeper than that of the PLLA sheet. The inclination of Medpor was steep during the early stages, but decreased during the later stages. The inclination of the PLLA sheet was relatively constant, but increased abruptly at ~8 to 9 N.

postoperative, loose connective tissue occupied the space the implant had occupied. The PLLA sheet used for reconstruction of the orbital floor fracture that is 15 mm in size was covered with loose connective tissue 3 weeks later in a goat study.[1] At 6 weeks postoperatively, resorption and remodeling of bone at the points of support of the implant were observed. At 12 weeks postoperatively, the orbital side showed significantly more dense capsule tissue than the antral side. At 19 weeks postoperatively, progression of the formation of a bony plate was found, which partially covered the implant from the border toward the center. At 26 weeks postoperatively, the antral side showed a mature connective tissue capsule. At 78 weeks postoperatively, a mature connective tissue capsule was detected. New bone had fully covered the PLLA implant on the antral and orbital sides. The perforations in the implant also were filled with new bone.

The PLLA sheet could be shaped when it is heated and decrease the operation time. It allows for sufficient temporary support of the internal orbital contents before it is resorbed. Theoretically, the implant leaves a sheet of fibrous tissue, allowing support of the globe that is sufficient once the implant has resorbed. There have been no problems with enophthalmos reported once the implant is fully resorbed.[3] In the past, a bone graft was the procedure of choice for a large orbital floor fracture without posterior-part support for the alloplastic implant. In this study, fixation of the PLLA sheet to the inferior orbital wall or fixation of Medpor to the inferior orbital wall could provide enough strength to support the internal orbital contents. The orbital floor is concave. The PLLA sheet is subject to elevated temperatures for a period, which can cause structural changes in its properties. The concave shape provides more strength to support the internal orbital contents.

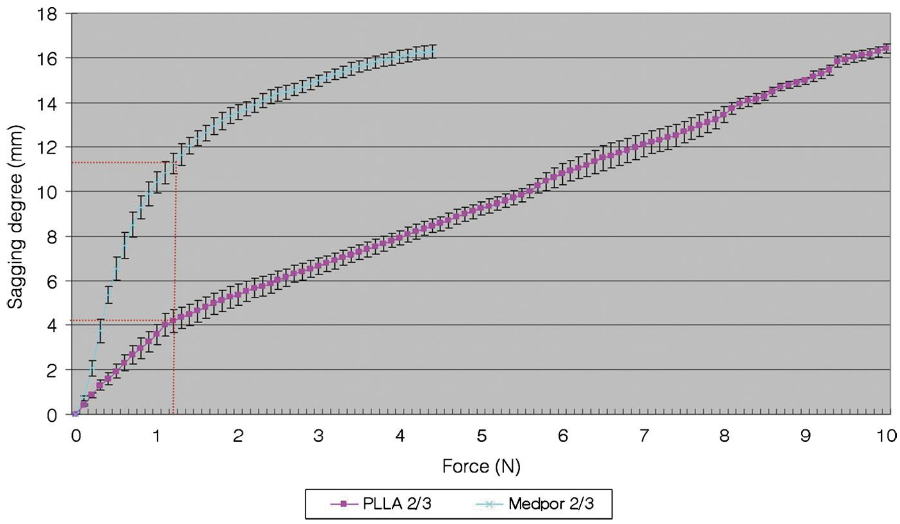

FIGURE 9. The degree of sagging of the implant and the force in the orbital floor fracture (two-thirds). The inclination of Medpor (porous polyethylene) was steeper than that of the PLLA sheet. As with the orbital floor fracture (one-half), the inclination of Medpor was steep in the early stages, but less steep in later stages. The inclination of the PLLA sheet was relatively constant, but increased abruptly at ~8 to 9 N.

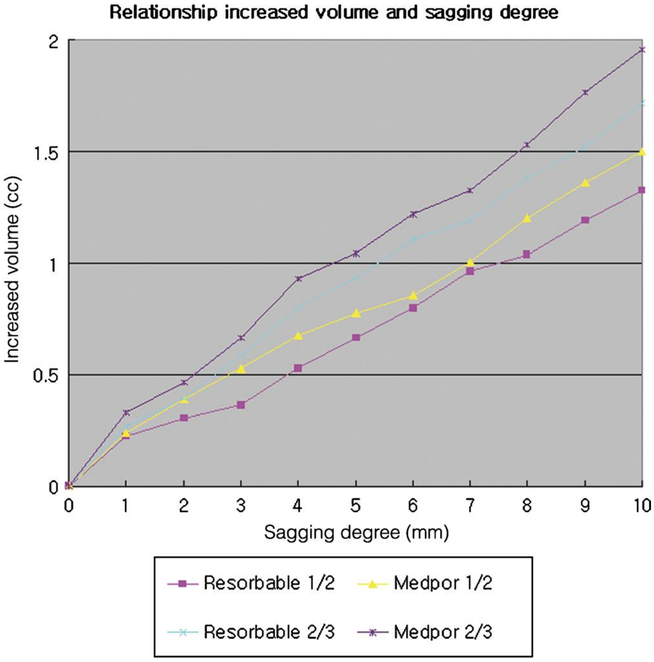

FIGURE 10. The volume was increased in accordance with the degree of sagging.

In a previous study, some investigator insisted that although the temporary support resorbable sheets provide until its resorption was usually sufficient, but they did not recommend its use in extensive orbital floor fractures where some volume replacement was also necessary. Ultimate resorption and replacement by fibrosis might not support orbital structure, and persistent enophthalmos could not be corrected.[2] However, in a goat study, a mature connective tissue capsule was formed after reconstruction with the PLLA sheet, and the progression of the development of a bony plate was found, forming from the border toward the center. The perforations in the PLLA sheet were filled with new bone after 78 weeks. The PLLA sheet should allow for sufficient temporary support of the internal orbital contents, especially during the period of formation of fibrous tissue or new bone, but be completely resorbed after healing is complete. The PLLA sheet was difficult to apply for reconstruction of large orbital floor fractures lacking a posterior part supporting the implant. However, fixation of the PLLA sheet to the inferior orbital wall could provide enough strength. Reconstruction with PLLA for large orbital floor fractures could reduce the operation time and prevent donor-site morbidity.

The limitations of this study include the following. The evaluations were not performed in humans. The issue of whether the orbital floor fibrous tissue was strong enough to support the internal orbital contents as the PLLA sheet resorbs was not resolved. There are some studies in animals supporting such strength of support for the internal orbital contents, but none in humans. However, the degree of sagging could be measured by an exophthalmometer or computed tomography indirectly. Another disadvantage is that the implant might be palpable on palpation. As PLLA sheet resorbs, this would resolve, but the patient would have to endure the discomfort until it was fully resorbed.

For one-half orbital floor fractures, the degree of sagging and increased orbital volume were 2.87 mm and 0.4 mL for the PLLA sheet and 7.96 mm and 1.19 mL for Medpor. The predicted enophthalmos was 0.41 mm for the PLLA sheet and 1.07 mm for Medpor. With the two-thirds orbital floor fractures, the degree of sagging and increased orbital volume were 4.28 mm and 0.78 mL for the PLLA sheet and 11.47 mm and 2.22 mL for Medpor. The predicted enophthalmos was 0.73 mm for the PLLA sheet and 1.93 mm for Medpor.

When PLLA sheet is heated, it undergoes a change in shape. Because the orbital floor is concave, this shape helps to support the internal orbital contents more rigidly. The results of this study showed that the PLLA sheet and Medpor could support the internal orbital contents for reconstruction of extensive orbital floor fractures, with the PLLA sheet providing greater rigidity.

TABLE 5. Trend Line for the Degree of Sagging and Increased Orbital Volume

	One-Half Fracture	Two-Thirds Fracture
PLLA sheet	$y = 0.1288x + 0.028$	$y = 0.165x + 0.0749$
Medpor	$y = 0.1416x + 0.0678$	$y = 0.1847x + 0.0972$

TABLE 6. Prediction of Enophthalmos According to the Degree of Sagging

	One-Half Fracture		Two-Thirds Fracture	
	PLLA	Medpor	PLLA	Medpor
Force, N	1.0776		1.2681	
Sagging degree, mm	2.87	7.96	4.28	11.47
Increased orbital volume, mL	0.4	1.19	0.78	2.22
Enophthalmos, mm	0.41	1.07	0.73	1.93

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