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ORIGINAL ARTICLE BODY CONTOURING

Buttock Lifting Using Elastic Thread (Elasticum®) with a New Classification of Gluteal Ptosis

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Abstract
Purpose Conventional buttock lifting is invasive, so it is difficult to recommend it to patients especially to those who do not have severe gluteal ptosis. In addition, the gluteal area is a large area change among the joints. Therefore, this surgery can cause pain during hip flexion after lifting using a conventional thread. The authors report on buttock lifting using an elastic thread with high satisfaction from patients.
Methods From July 2016 to June 2017, 60 patients were enrolled in this study. The degree of gluteal ptosis was graded from Grade 0 to Grade 6. All patients underwent lifting of both buttocks using Elasticum®. We drew a circle along the outer edge of the buttock and another small circle inside the first circle. A stab incision was done at 5 points (A, B, C, C′, and D), and then according to the circle, lifting was done. Postoperative grade changes and complications were evaluated.
Result Grades 2–5 were lifted to at least Grade 2 after surgery, but Grade 6 was at most Grade 3 (14.2%), with 85.8% of these to either Grade 5 or Grade 6. Seven patients (11.67%) complained of postoperative pain, and 6 patients (10.00%) showed skin dimpling or creases 10 days after surgery, all of which disappeared at 1 month after surgery.
Conclusion Buttock lifting with elastic thread is effective in pre-ptosis to moderate gluteal ptosis. Because of the elasticity of the thread, postoperative pain is low on hip flexion, so the lifting is done naturally.
Level of Evidence IV This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

Keywords Buttock rejuvenation · Thread lift · Elastic thread

Introduction

The buttocks are a very important part of the body line and are of great interest to many young and middle-aged women [1]. The buttocks can be a problem if the volume is too small or too large, and it also lowers women's self-esteem if their hips have ptosis. A number of methods have been introduced to improve sagging of the buttocks. In the conventional method, a direct incision is made under the infragluteal fold area to remove the skin and fatty tissue of the lower hips [2], or the incision is made along the iliac crest area to lift the buttock; [3] however, these methods result in a lot of scarring after surgery [4], and it is difficult to recommend it to Asian people.

Recently, buttock lifting has been reported using a noninvasive method, which has the effect of pulling the tissue directly through the thread to lift the sagging buttock tissue [5, 6]. However, the hip is painful during flexion

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after thread lifting of the buttock where the area change is large during flexion, and gluteal ptosis recurs.

Elasticum® is an elastic thread with a long needle that has recently been used for face-lifts [7], especially when creating a variety of facial expressions. It is stretched according to the movement of the actual facial muscles, unlike conventional thread. It has been reported that it creates a natural lifting effect because it is not awkward due to its elasticity. Therefore, the authors perform buttock lifting using the Elasticum® and reported good satisfaction of the patients.

Materials and Methods

Patients

From July 2016 to June 2017, 60 patients who visited our clinic with hip sagging were selected for buttock lifting using Elasticum. The degree of hip sagging, fat distribution, and the volume of the hip was examined before surgery, and a fat graft was performed at the hip area and the lateral gluteal depression area when the volume was insufficient. Patients' sex, age, height, weight, and BMI were also recorded.

Grade of Gluteal Ptosis

The degree of gluteal ptosis was classified according to the method introduced by Constantino [8] and Raul [9] as follows (Fig. 1) (Table 1):

- Grade 0 (no ptosis): There is no infragluteal fold, or the fold is limited to the virtual line that passes vertically through the ischial tuber (T line).
- Grade 1 (minimal pre-ptosis): The infragluteal fold is over the T line, but fails to reach the virtual line that passes vertically through the middle of the thigh (M line); there is no ptotic tissue at the T line.
- Grade 2 (moderate pre-ptosis): The fold reaches the M line, but there is no ptotic tissue at the M line.
- Grade 3 (borderline pre-ptosis): The fold is over the M line, but still there is no ptotic tissue at the M line.
- Grade 4 (mild ptosis): The gluteal tissue passes over the infragluteal fold at the M line; on the lateral view, we evaluate the angle of the skin fold at the infragluteal fold; in Grade 4, the angle is less than 10°.
- Grade 5 (moderate ptosis): The gluteal tissue passes over the infragluteal fold at the M line; the angle of the skin fold at the infragluteal fold is between 10° and 30°.
- Grade 6 (severe ptosis): The gluteal tissue passes over the infragluteal fold at the M line; the angle of the skin fold at infragluteal fold is more than 30°.

Thread

Elasticum® consists of an elastic thread and a Jano needle®. The elastic thread consists of a silicone core with a polyester sheath, so it can be stretched up to 100% (Video 1). The Jano needle® consists of a tubular metal shaft for higher bending strength, with a two-tipped long needle. At the end of the shaft, there are 5 scale marks of 1 cm lengths on both sides. The elastic thread is attached to the center portion of the needle (Fig. 2).

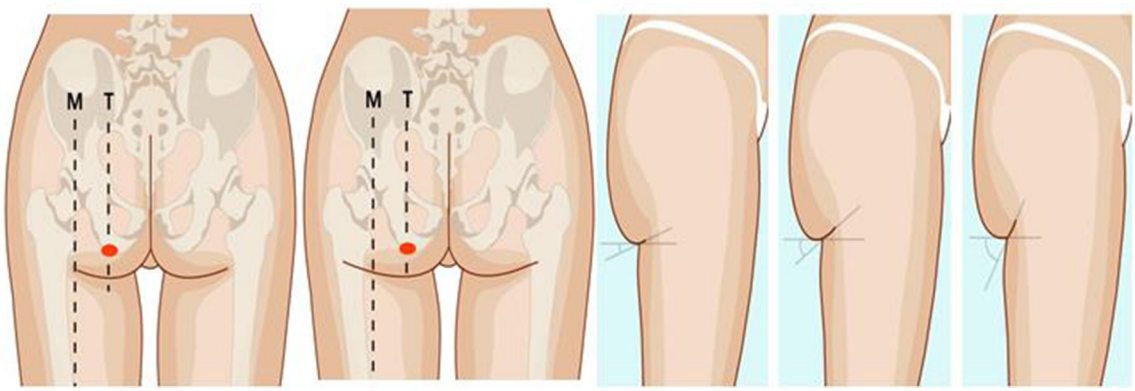

Fig. 1 Illustration of buttock ptosis grades. Illustration of ptosis Grade 2 to Grade 6 from left to right. Grade 2 (moderate pre-ptosis): the fold reaches the M line, but there is no ptotic tissue at the M line. Grade 3 (borderline pre-ptosis): the fold is over the M line, but still there is no ptotic tissue at the M line. Grade 4 (mild ptosis): the gluteal tissue passes over the infragluteal fold at the M line; on the lateral view, we evaluate the angle of the skin fold at the infragluteal fold; in Grade 4, the angle is less than 10°. Grade 5 (moderate ptosis): the gluteal tissue passes over the infragluteal fold at the M line; the angle of the skin fold at the infragluteal fold is between 10° and 30°. Grade 6 (severe ptosis): the gluteal tissue passes over the infragluteal fold at the M line; the angle of the skin fold at infragluteal fold is more than 30°

Table 1 Grade of gluteal ptosis

	Length of infragluteal fold	Ptosis at M line	Angle of the skin fold at infragluteal fold
Grade 0	< T line	X	
Grade 1 (minimal pre-ptosis)	T line < fold < M line	X	
Grade 2 (moderate pre-ptosis)	= M line	X	
Grade 3 (borderline pre-ptosis)	> M line	X	
Grade 4 (mild ptosis)	> M line	O	<10°
Grade 5 (moderate ptosis)	> M line	O	10° < Angle < 30°
Grade 6 (severe ptosis)	> M line	O	>30°

M line: the virtual line that passes vertically through the middle of the thigh

T line: the virtual line that is passes vertically through the ischial tuberosity

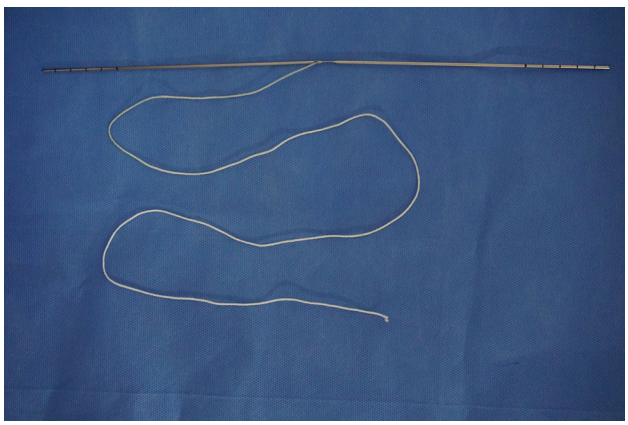

Fig. 2 Elasticum® used for buttock lifting. Elasticum® consists of an elastic thread and a Jano needle®. The elastic thread consists of a silicone core with a polyester sheath, so it can be stretched up to 100%. The Jano needle® consists of a tubular metal shaft for higher bending strength and a two-tipped long needle. At the end of the shaft, there are 6 scale marks of 1 cm lengths on both sides. The elastic thread is attached to the center portion of the needle

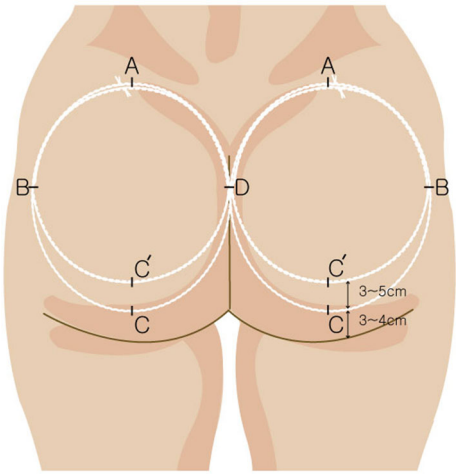

Fig. 3 Illustration of the distribution of sutures with the patient in the orthostatic position. The uppermost point of the hips starting from the waist to the hip is marked as (A), 3–4 cm above the center point of the infragluteal fold as (C), the outermost point of the buttocks is marked at the middle height between A and C as (B), and the innermost point as (D). C′ is marked at a point 3–5 cm above the C mark. To indicate the pathway of the thread to be anchored, a large circle connecting the ABCD points and a small circle connecting the ABC′D points are drawn

Design

First, the stab incisions are marked on both hips for insertion and removal of the Jano needle®.

The uppermost point of the hips starting from the waist to the hip is marked as (A), 3–4 cm above the center point of the infragluteal fold as (C), the outermost point of the buttocks which was marked at the middle height between A and C as (B), and the innermost point as (D). C′ is marked at a point 3–5 cm above the C mark. To indicate the pathway of the thread to be anchored, a large circle connecting the ABCD points and a small circle connecting the ABC′D points are drawn (Fig. 3).

Operation Method

In the prone position, local anesthesia is applied to the site using 60 cc of 0.5% lidocaine with 1:200,000 epinephrine.

A 5-mm incision is made at point A, a 2-mm incision is made at point B, C, C′, and the blunt dissector is used to dissect to the muscle (gluteus maximus) fascia layer beneath the deep fat layer. The tip of the elastic thread is held with a Kelly, and the Jano needle® is inserted; the depth of the deep fat layer is checked using the needle tip scale mark, and the needle is run along the circle toward point B through the deep fat layer. At this time, be careful to rotate the needle horizontally to prevent trauma to the deep tissue. The Jano needle® is carefully removed from point B, leaving the opposite tip of the needle as deep as the depth of the first fat layer that was already checked. Then, the thread which is attached to the middle of the needle is pulled out to point B, leaving only the area held by the Kelly at point A. The tip of the Jano needle® which

does not come out is turned 180° toward the next point (C) and back down the line of the circle. In this way, the Elasticum® continues to pass through the same deep fat layer as the first one, and then, it is hung at the bottom and inner anchoring points (C, D) and returned to point A at 12 o'clock. The remaining thread on the needle is cut, leaving a sufficient amount to tie. The thread that was initially held with the Kelly and the thread that is returned at point A after anchoring points ABCD are pulled together upwards to confirm that the tissue is lifting. When the tissue is lifted with the appropriate position (leaving the thread 1–1.5 cm more stretchable after tied), the thread is tied up to 7 times. The same procedure is followed for the small circles (Video 2).

If indicated, liposuction is then performed on the paragluteal areas, and fat grafting or filler injection is done to increase the esthetic results and buttock volume.

The skin incisions are sutured with 5–0 nonabsorbable suture (PDS®) and 6–0 nylon. Finally, the surgical area is covered with elastic tape (Benestork®, Nippon Sigmax Co., Ltd) to minimize postoperative edema and pain.

Evaluation of Operation Results

On the 10th day after surgery, the patients are checked for infection, hematoma, pain, skin dimpling on the anchoring site, creases along the thread pathway, and whether the thread is exposed. And total stitch out was done. At 1 month after surgery, the grade is re-evaluated to assess postoperative grade change. Finally, when we checked at 6 months after surgery, we confirmed the change of the grade compared to the first month.

Results

Epidemiology

A total of 60 patients participated in the study. All patients were female, the mean age was 36.37 ± 8.14 years, and BMI was 21.33 ± 1.62 kg/m^2.

Operation Results

The prevalence of gluteal ptosis was 16 patients (26.67%) in Grade 4, 15 patients (25.00%) in Grade 3, 14 patients (23.33%) in Grade 5, 8 patients (13.33%) in Grade 2, and 7 patients (11.67%) in Grade 6. After the buttock lifting operation, Grade 0 was the most frequent, appearing in 29 patients (48.33%), followed by Grade 1 in 17 patients (17.3%), Grade 2 in 7 patients (11.67%), Grade 3 in 1 patient (1.67%), Grade 4 in 0 patients (0%), Grade 5 in 3 patients (5%), and Grade 6 in 3 patients (5%).

The postoperative changes in each grade before surgery were as follows. Preoperative Grade 2 (a total of 8 patients) was changed to Grade 0 in 7 patients (87.50%), and 1 patient changed to Grade 1 (12.50%) (Fig. 4). Preoperative Grade 3 (a total of 16 patients) was changed to Grade 0 in 10 patients (62.50%), Grade 1 in 4 patients (25.00%), and Grade 2 in 2 patients (12.50%) (Fig. 5). Preoperative Grade 4 (a total of 15 patients) was changed to grade 0 in 8 patients (53.33%), Grade 1 in 5 patients (33.33%), and Grade 2 in 2 patients (13.33%) (Fig. 6) (Fig. 7). Preoperative Grade 5 (a total of 14 patients) was changed to grade 0 in 4 patients (28.57%), Grade 1 in 7 patients (50.00%), and Grade 2 in 3 patients (21.43%) (Fig. 8). Preoperative Grade 6 (a total of 7 patients) remained as Grade 6 in 3 patients (42.86%) (Fig. 9) and changed to Grade 5 in 3 patients (42.86%) and Grade 3 in 1 patient (14.28%) (Table 2) (Fig. 10).

There were no patients who changed grades between the 1st month and 6th month after surgery. One patient was followed up for 14th months after surgery and the lifting effect remained (Fig. 11).

Fig. 4 Preoperative and postoperative photographs of Grade 2 gluteal ptosis. The left side is the preoperative image, and the right side is the 10th day postoperation. Preoperative gluteal ptosis was Grade 2, and postoperative ptosis improved to Grade 1

Fig. 5 Preoperative and postoperative photographs of Grade 3 gluteal ptosis. The left side is the preoperative image, and the right side is 3 months postoperation. Preoperative gluteal ptosis was Grade 3, and postoperative ptosis improved to Grade 0

Fig. 6 Preoperative and postoperative photographs of Grade 4 gluteal ptosis. The left side is the preoperative image, and the right side is the 10th day postoperation. Preoperative gluteal ptosis was Grade 4, and postoperative ptosis improved to Grade 2

Complications

There were no cases of infection, hematoma, transcutaneous thread visibility, thread palpation, or extrusion at the thread courses. Skin dimpling or creases at the thread course occurred in 6 cases (10.00%) 10 days after lifting. However, after 1 month, all of the dimples or creases disappeared (Fig. 12). Seven patients (11.67%) complained of pain on the 10th day, the location of which was predominantly on the lateral side of the buttocks. However, there was no need for pain medication because it was not severe enough, and no one complained of pain at the 1-month visit. There were no cases in which the thread had to be removed due to pain (Table 3).

Discussion

Conventional buttock lifting has a long incision that leaves a lot of scarring, and the dissection range is wide, resulting in postoperative pain. Therefore, the conventional procedure cannot be recommended for patients with less severe gluteal ptosis. Elasticum® is a noninvasive thread lift with only 5 stab incisions per hip, and compared to conventional buttock lifting leaves a shorter scar and causes less pain.

Classification of gluteal ptosis has been previously reported by Constantino et al., and Raul et al. [9] define degree 0 as normal and divide degrees 1, 2, and 3 by infragluteal fold length, and degree 4 in which the gluteal tissue appears below the infragluteal fold. This classification is convenient for dividing the entire gluteal ptosis stage using the length of the infragluteal fold. In the case of buttock lifting using Elasticum®, the length of the infragluteal fold was reduced as a result of lifting the outer circle, which has an advantage in evaluating the result of buttock lifting. Javier et al. [5] use the classification of Raul et al. and report that lifting the gluteal region using the Silhouette suture was indicated for surgery up to degree 3 but contraindicated from degree 4. On the other hand, our operation is considered for lifting, if not severe, in degree 4, and this classification, expressed as one degree regardless of the degree of ptosis, was inconvenient for showing our surgical indication. On the other hand, Constantino et al.'s ptosis classification has 3 stages of the pre-ptosis stage: Class A, Class B, and Class C, and ptosis has 3 stages of Grade 1, Grade 2, and Grade 3 using the angle of

Fig. 7 Preoperative and postoperative photographs of Grade 4 gluteal ptosis. The left side is the preoperative image, the middle side is the 10th day postoperation, the right side is the 6th month postoperation. Preoperative gluteal ptosis was Grade 4, and postoperative ptosis improved to Grade 2. There was no grade change between 10th day and 6th month after surgery

the skin fold of the infragluteal fold [8]. It was somewhat difficult to use this classification because the boundary between Class B and Class C is unclear, and pre-ptosis and ptosis are considered to be a series of processes when the two are separated and graded. However, this classification has the advantage of the ptosis itself being divided into 3 stages so the degrees of ptosis can be known. Therefore, we combined the classifications of Constantino et al. and Raul et al. to create a new classification that divides gluteal ptosis from Grade 0 to Grade 6, a total of 7 stages. This new classification uses the same method as Raul et al.'s classification for Grade 0 (no ptosis), pre-ptosis for Grades 1–3, and the classification of Constantino et al. was used for cases with actual gluteal ptosis (Grades 4–6).

Keeping the thread anchored at the time of the thread lift is a very important factor in lifting results and ptosis recurrence. There are 2 factors. One is the force anchoring the surrounding tissue (a), and the other is the force against the lifting of the anchoring tissue (b). If (a) is stronger and (b) is weaker, lifting is better and results are better maintained; conversely, if (b) is stronger than (a), the "cheese cutting effect" occurs, in which tissue can be cut by the thread, and the result is not good.

Force (a) will be stronger as the tissue response to the thread used for lifting becomes better. Richard et al. compare the tissue responses to monofilament sutures and braided sutures. The monofilament suture was simply surrounded by the inner tunica of the collagen formed around it, but the braided suture contained collagen and fibroblasts between each individual suture filament; more fibroblasts were in the surrounding tissue and the collagen layer was formed more thickly than in the monofilament. This also implies that braided threads make tissue fixation stronger than monofilament threads can [10]. Elasticum® is a braided suture covered with numerous polyester sheaths on a silicone core, which is believed to make tissue fixation stronger during buttock lifting than the monofilament threads used previously.

Force (b) will be stronger with a greater volume of gluteal tissue or a greater movement of the muscle or joint. The hip joint is a large joint of greater movement. Javier et al. [5] divide hips into 15 zones and measure the changes in the skin area at each standing and crouched position. In the area of the lower hip, the infragluteal fold area increased 110% when sitting. However, Elasticum® is an elastic thread and can stretch up to 100%. At the time of surgery, after anchoring, the thread is pulled up to perform lifting, and at the same time, it is tied with enough elasticity to be stretched. Therefore, it has the effect of reducing the (b) force to some extent due to the elasticity of

Fig. 8 Preoperative and postoperative photographs of Grade 5 gluteal ptosis. The left side is the preoperative image, and the right side is the 10th day postoperation. Preoperative gluteal ptosis was Grade 5, and postoperative ptosis improved to Grade 1. The volume of the buttock was so small that a 90 cc filler injection was applied to the upper and lateral sides of both buttocks

the thread during hip flexion. Elasticum® provides stronger (a) and less (b) than conventional thread, so it results in less "cheese cutting effect," and therefore, it seems to be well maintained after lifting. In fact, the lifting effect did not decrease for 6 months in this study.

In the results of our surgery, preoperative Grade 2–Grade 5 patients changed to at least Grade 2 postoperatively. However, preoperative Grade 6 patients changed at most to Grade 3 (14.28%) and the others to Grade 5 (42.86%) and Grade 6 (42.86%). In cases of severe ptosis such as Grade 6, the volume of the anchored tissue is very large. In other words, (b) is strong, so the result is not satisfactory with lifting by thread (Fig. 8). Therefore, only patients with gluteal ptosis up to Grade 5 should be indicated for this procedure.

The conventional thread used in a buttock lift is not elastic and causes pain when the hip joint is moved after the operation. Ballivian et al. report postoperative traction pain that occurs when sitting as a postoperative complication after buttock lifting using conventional thread. This pain may disappear spontaneously but can last longer than

Fig. 9 Preoperative and postoperative photographs of Grade 6 gluteal ptosis. The left side is the preoperative image, and the right side is the 14th day postoperation. Preoperative gluteal ptosis was Grade 6; there was postoperative improvement, but it was still Grade 6 after surgery

3 weeks. In this case, the thread is removed [6]. In buttock lifting using Elasticum®, 6 patients (10%) complained of pain on the 10th day after surgery, but the degree of discomfort was very low. None of the patients complained about discomfort at 1 month after surgery. It is thought that this is natural lifting because hip flexion does not cause pain compared to conventional thread because of the elasticity of Elasticum®.

Anchoring in the superficial layer may result in dimples or creases as the skin is retracted along the course of the thread. Therefore, it is very important to find the appropriate depth during surgery. The less severe dimpling usually improves with massage within 1 month. However, long-term follow-up and further studies are needed to determine whether anchoring the thread to an incorrect position will result in thread breakage or reduced elasticity in excessive hip flexion.

This procedure may be performed alone, or it may be combined with other surgeries. If a thread lift is used alone with a patient who has buttocks with a very low volume, the thread can be seen or touched at the thread pathway or dimpling can occur. In this case, a fat graft or filler injection may be combined with the lifting. One patient in our case had a filler injection in the upper and middle parts of the hips because there was no place to harvest fat from (Fig. 7). Additionally, if there is a lot of fat in the

Table 2 Postoperative results by grade of gluteal ptosis

	Grade 2[b]	Grade 3[b]	Grade 4[b]	Grade 5[b]	Grade 6[b]	*N*
Grade 0[a]	7 (87.50%)	10 (62.50%)	8 (53.33%)	4 (28.57%)		29 (48.33%)
Grade 1[a]	1 (12.50%)	4 (25.00%)	5 (33.33%)	7 (50.00%)		17 (28.33%)
Grade 2[a]		2 (12.50%)	2 (13.33%)	3 (21.43%)		7 (11.67%)
Grade 3[a]					1 (14.28%)	1 (1.67%)
Grade 4[a]						
Grade 5[a]					3 (42.86%)	3 (5.00%)
Grade 6[a]					3 (42.86%)	3 (5.00%)
N	8 (13.33%)	16 (25.00%)	15 (26.67%)	14 (23.33%)	7 (11.67%)	60

Results are presented as *N* (%)

[a]Preoperative grade of gluteal ptosis

[b]Postoperative grade of gluteal ptosis

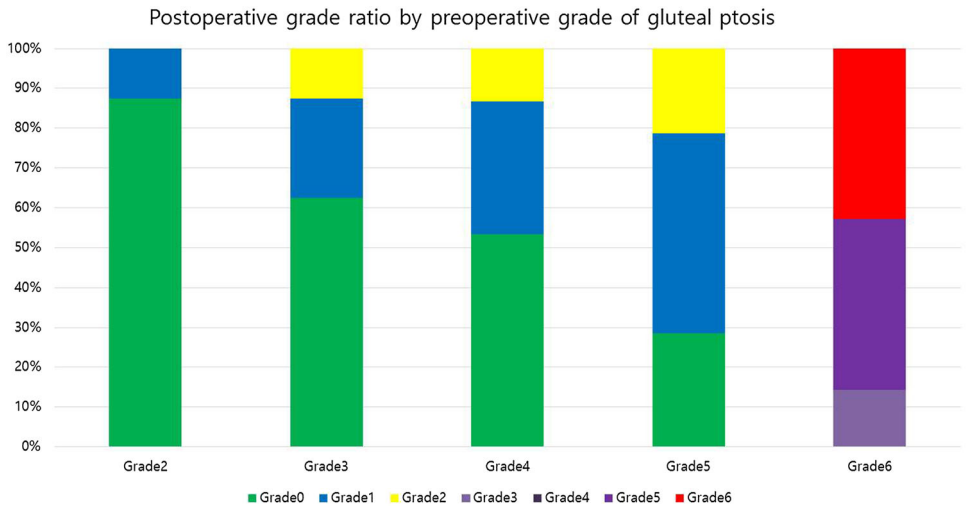

Fig. 10 Postoperative grade ratio by preoperative grade of gluteal ptosis. Grades 2–5 were lifted to at least Grade 2 after surgery, but Grade 6 was at most Grade 3 (14.2%), with 85.8% as either Grade 5 or Grade 6

Fig. 11 Preoperative and postoperative photographs of Grade 5 gluteal ptosis. The left side is the preoperative image, and the middle side is 2nd month postoperation, the right side is 14th month postoperation. Preoperative gluteal ptosis was Grade 5, and postoperative ptosis improved to Grade 2. Lifting effect remained until 14th month

lumbosacral area, also called the "love handles," liposuction may be combined to make the curvature of the hip more prominent, which may improve the cosmetic result.

Conclusion

Buttock lifting using Elasticum® is much less invasive than conventional buttock lifting because of the shorter incision length and smaller dissection area. The authors think this technique is effective in mild to moderate gluteal ptosis patients. In addition, Elasticum® is more elastic than other

Fig. 12 Disappeared crease along the course of the thread after 1 month. The left side is the preoperative image, the middle is the 10th day postoperation, and the right side is 1 month postoperation. On the 10th day after surgery, a little crease remained along the line of the thread, but this crease disappeared at 1 month and it became more natural-looking

Table 3 Complications of buttock lifting using elastic thread

	Postoperative 10 days	Postoperative 1 month	Postoperative 6 months
Pain	7 (11.67%)	0	0
Skin dimpling or crease	6 (10.00%)	0	0
Recurrence	0	0	0
Infection	0	0	0
Hematoma	0	0	0
Transcutaneous thread visibility/palpation	0	0	0
Thread extrusion	0	0	0

threads, so it causes less postoperative pain and the lifting is done naturally. Therefore, we think it might be a good surgical material for buttock lifting.

Compliance with Ethical Standards

Conflict of interest The authors have no conflict of interest to declare.

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