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Labiopexy and Labioplasty for Labium Majus Rejuvenation in Light of a Newly Discovered Anatomic Structure

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Abstract
Background Currently, removal of excessive cutis with subdermal adipose tissues is done for labium majus rejuvenation. The objectives of this study were to determine the accurate labium majus anatomy, to develop new labiopexy and labioplasty techniques, to attest to the applicability of these two new operations, and to determine the impact of the operations on self-perceived body image and sensation of nerve endings.
Methods A prospective case series study was conducted. Eleven fresh human female cadavers and three living subjects were studied. Living subjects were healthy women and presented with labium majus deformities. The study was conducted in three phases: phase I, the labium majus anatomy of the cadavers was studied; phase II, anatomic findings from phase I were used to develop and standardize new stepwise surgical interventions; and phase III, newly developed operations were implemented on living subjects. Labial sensation tests of nerve endings were performed preoperatively and at 6 months postoperatively. The primary outcome measured the labial anatomy and applicability of the new operations. The secondary outcome measured the self-perceived body image and sensation of nerve endings before and after surgery.
Results A new anatomic feature, the labium majus adipose sac, was discovered and was present in each subject. Labium majus labiopexy and labioplasty were executed without technical difficulties or complications. Postoperatively, the self-perceived body image improved and sensation of nerve endings was intact.
Conclusions The labium majus adipose sac is present in each woman. Intraoperatively, newly developed labium majus labiopexy and/or labioplasty do not create technical problems. Self-perceived body image improves and sensation of the nerve endings is intact after labiopexy or labioplasty.
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Keywords Labia majora anatomy · Labia majora adipose sac · Labia majora rejuvenation

Introduction

Ostrzenski defines *cosmetic gynecology* as the transformation of female external genital gross anatomy to a more aesthetically pleasing appearance and *plastic* (*reconstructive*) *gynecology* as restoration or improvement of the functional anatomy of female genitalia (www.cosmetic-gyn.com). Demands for cosmetic-plastic gynecologic interventions are on the rise, including, but not limited to, labium majus rejuvenation [1]. Currently, the existing concept of labium majus surgical labioplasty techniques is based upon a vertical incision and removing en bloc the

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cutis with subcutaneous fat tissues [2, 3]. Such a surgical approach removes the strip of skin and the adipose tissue beneath the skin resulting in loss of the natural semiballoon appearance of the labium majus. Also, such a technique destroys the labial adipose sac [2, 3].

Recently, several articles related to labioplasty of the labium majus were published in the clinical/scientific journals [4–7]. A labium majus labioplasty could be executed as a concomitant procedure by the traditional method previously described elsewhere [2, 3]. In one of the reports, labia majora reduction was performed concurrently with clitoral size reduction [4]. In another publication, simultaneous reduction of the labia minora and the labia majora were performed [5]. Labia majora labioreduction was done to treat labia majora enlargement, which was caused by chronic exposure to antiretroviral therapy for HIV [7].

The hypothesis of whether labium majus anatomic disfigurements were associated with underlying Colles' fascia laxity, adipose sac defects, and skin laxity was established and tested. A prospective case series study was designed to determine the accurate labium majus anatomy, to develop new labium majus rejuvenation techniques (labiopexy and labioplasty), to attest to these new operations' applicability, and to determine the impact of the new labium majus labiopexy and labioplasty operations on self-perceived body image and sensation of nerve endings. Ostrzenski define labiopexy as a new surgical intervention that decreases the size of Colles' fascia and reduces the cutis of the labium majus without the adipose tissue. By doing so, the labium majus fat tissue is maintain within the adipose sac, which becomes more compressed. It reduces the base on which the labium majus adipose sac rests. Reduction of Colles' fascia brings back a natural semiballoon contour of the labium majus. A new labium majus labioplasty technique consists of reconstruction of site-specific defect(s) of the adipose sac and excision of the cutis just above the adipose sac tissue.

A search of MEDLINE, ACOG online database, HealthSTAR, Cochrane Library database, and OviDisc database for pertinent articles on the labium majus anatomy and on labium majus labiopexy and labioplasty was conducted using medical subject headings (MeSH) and related keywords; a manual search was also conducted.

Materials and Methods

The study was conducted in three phases: phase I, a study on fresh human female cadaver labium majus anatomy was performed; phase II, new anatomic findings from phase I were used to develop and standardize new stepwise surgical interventions; and phase III, the newly developed procedures of labiopexy and labioplasty for labium majus rejuvenation were implemented into surgical practice. The Ethics Committee approved the study's protocol (AKBE 146/12).

Eleven fresh female cadavers constituted material for phases I and II of the study. The age range of the cadavers was 27–83 years. Three living subjects (subject No. 1, age = 34 years, G_2P_{2002}; subject No. 2, age = 37 years, G_3P_{1021}; and subject No. 3, age = 42 years, G_0P_{0000}) were the study samples for phase III. All three living women were healthy and requested labium majus rejuvenation for aesthetic reasons.

New labiopexy and labioplasty surgical interventions were developed in the dry and wet laboratories and standardized on fresh female cadavers. The standardized operations were performed on three consecutive Caucasian living women. Written informed consent was obtained from the three women and was structured in accordance with existing recommendations [8]. In addition, the living subjects authorized the use of their clinical data and digital photo images of their genital organs for publication in medical peer review journals.

Preoperatively and 6 months postoperatively the subjects were examined and tested using the same standardized methods. Clinical evaluations and testing of perception sensation thresholds of nerve endings were executed. A subject-perceived static and moving cutaneous pressure, poking with a lacrimal probe, and application of cold and warm were used. Such testing provided valuable information to rule out postoperative numbness, hypo- or hypersensitivity, and hypo- or hyperreactivity of the labial nerve endings. In addition, the validated Modified Body Image Scale instrument was utilized to determine self-perceived body image and quality of life (Table 1).

The three living subjects who were included in the study were able to understand the consent form and voluntarily agreed to labium majus labiopexy and/or labioplasty. The nine women who were excluded had scars from a previous obstetrical or gynecologic surgery or trauma or had a history of superficial dyspareunia. Those subjects who were pregnant or diagnosed with psychological or mental instability were also excluded as were those with acute or chronic vulvar skin abnormalities, diabetes, asthma treated with steroids, or any other medical condition that could affect or prolong the healing process. Also, subjects who chose forms of anesthesia other than local were excluded from the study. Women who could not commit to a follow-up or did not agree to be photographed also were excluded.

The primary outcome measured the labium majus anatomy and the applicability of the new procedures of labium majus labiopexy and labioplasty. The secondary outcomes measured the self-perceived body image and the sensation of nerve endings before and after surgery.

Table 1 Ostrzenski's modification of the body image scale for labia majora disfigurements

		Not at all[a] points 0				A little[b] points 1				Quite a bit[b] points 2				Very much[b] points 3			
		S	1	2	3	S	1	2	3	S	1	2	3	S	1	2	3
1. Have you been feeling self-conscious about your labia majora appearance?	B	–	–	–		–	–	–		×	×	–		–	–	×	
	A	×	×	×		–	–	–		–	–	–		–	–	–	
2. Have you felt less physically attractive due to your labia majora deformity?	B	–	–	–		–	–	–		–	×	–		×	–	×	
	A	×	×	×		–	–	–		–	–	–		–	–	–	
3. Have you been dissatisfied with your labia majora appearance when you dressed?	B	×	×	–		–	–	×		–	–	–		–	–	–	
	A	×	×	×		–	–	–		–	–	–		–	–	–	
4. Have you been feeling less feminine due to your labia majora deformity?	B	–	–	–		–	–	–		–	–	–		×	×	×	
	A	×	×	×		–	–	–		–	–	–		–	–	–	
5. Did you find it difficult to look at your labia majora naked?	B					×	–	–		–	×	–		–		×	
	A	×	×	×		–	–	–		–	–	–		–	–	–	
6. Have you been feeling less sexually attractive due to your labia majora deformity?	B	–	–	–		–	–	–		–	–	–		×	×	×	
	A	×	×	×		–	–	–		–	–	–		–	–		
7. Did you avoid a new relationship due to the way you felt about your labia majora deformity?	B	–	–	–		–	–	–		–	×	–		×	–	×	
	A	×	×	×													
8. Have you felt dissatisfied with your body image due to your labia majora deformity?	B	–	–	–		–	–	–		–	–	–		×	×	×	
	A	×	×	×		–	–	–		–	–	–		–	–	–	

Total score	Subject	Before surgery	6 months after surgery
	No. 1	18	0
	No. 2	17	0
	No. 3	21	1

The modified body image scale for subjects with posterior perineum abnormalities. Modified from Jelovsek and Barber [14]

[a] Answers measured as being within defined limits ("0")

[b] Answers measured as being abnormal (assigned pain: 1—mild; 2—moderate, 3—severe)

S1, 2, 3 subject No. 1, No. 2, No. 3; *B* before surgery; *A* after surgery; –, no; ×, yes

Local Anesthesia

Labium majus labiopexy and labioplasty were performed under local anesthesia. One hour before surgical intervention, lidocaine/procaine (2.5/2.5 %) topical cream (E. Fougera & Co., Melville, NY, USA) was applied on the labium majus cutis bilaterally. Immediately before and during the labiopexy procedure, the labium majus cutis, subcuticular areas, and predetermined areas of Colles' fascia were infiltrated with 1 % plain lidocaine. The lidocaine volume used was between 5 and 10 ml on each side.

Stepwise Approach to Surgical Technique

A longitudinal incision was made between the hairline of the labium majus and the hairless edge of the intralabial crease (Fig. 2a). The adipose sac of the labium majus was identified in a hypodermic stratum and bluntly separated from the Colles' fascia (Fig. 3a). The Colles' fascia was identified and laxity was determined (Fig. 3b). The amount of the Colles' fascia to be reduced was established. An elliptical tissue excision was carried out to restore the desired tension to the Colles' fascia (Fig. 3b). The fascia edges were approximated with single-type 2-0 delayed absorbable sutures.

The adipose sac's defects were identified (Fig. 2b), and the defects' edges were scarified with a No. 15 surgical blade. The scarified edges of the adipose sac's defects were approximated with single-type 3-0 absorbable sutures (Fig. 4a). The excess cutis, without the adipose tissue, was trimmed and then the cutis was approximated with single-type 3-0 absorbable sutures (Fig. 5b). All three elements—the Colles' fascia, adipose sac, and excessive cutis—were reconstructed.

Results

Electronic and manual searches, failed to identify any scientific/clinical article related to labium majus disfigurement restoration by means of labium majus adipose sac reconstruction or labiopexy. Both searches, electronic and

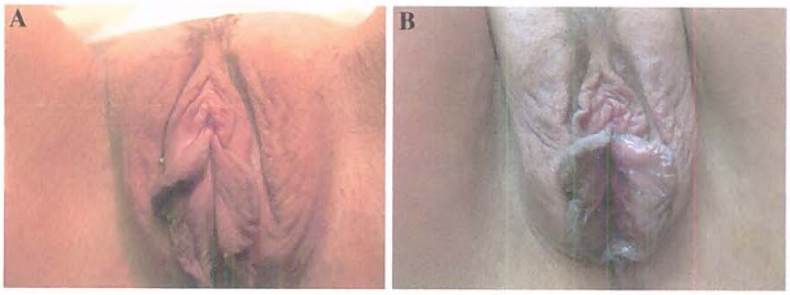

Fig. 1 **a** The general appearance of the labia majora in the dorsolithotomy position. **b** The same patient in the sitting position with visible multiple fat sac defects

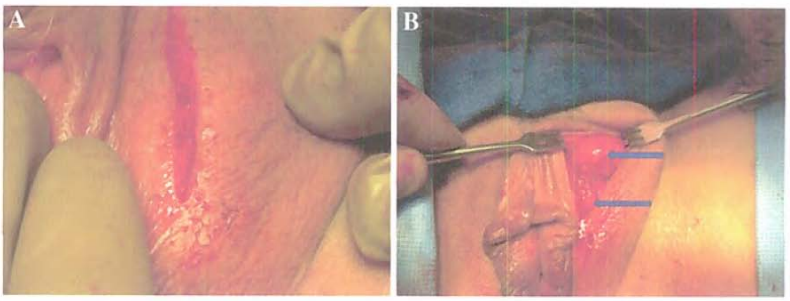

Fig. 2 **a** The incision made on the edges between the hairless and the hairy parts of the skin. **b** The fat sac defects are identified (*blue arrows*)

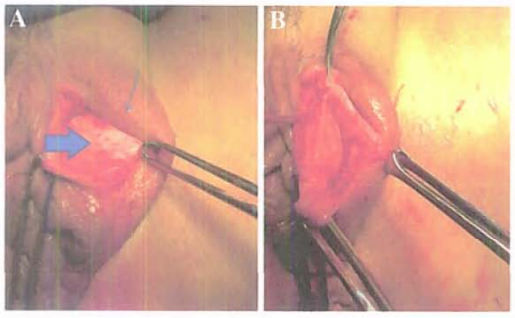

Fig. 3 **a** The Colles' fascia is exposed (*thicker blue arrow*) and stretched. The adipose sac was moved aside together with the cutis (*thinner blue arrow*). The labium majus with the compressed adipose sac creates a semiballoon appearance with vanishing wrinkles (*thinner blue arrow*). **b** Laxity of the Colles' fascia is depicted and the amount that needs to be removed in the elliptical excision is clearly delineated

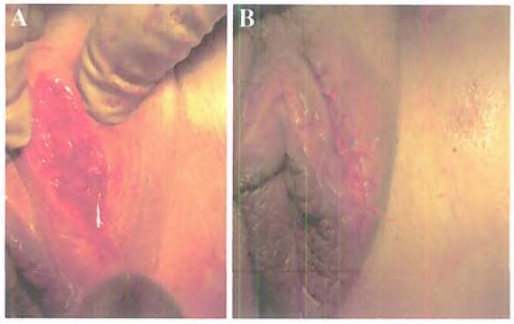

Fig. 4 **a** Closing the fat sac defects with 3-0 absorbable sutures. **b** An immediate postoperative view

manual, indicated that labium majus labiopexy or labium majus adipose sac reconstruction for an acquired anatomic disfigurement are new concepts of surgical techniques.

This investigation determined that the labium majus adipose tissue is compacted within the sac (Fig. 6a). The intraoperative observation confirmed that the labium majus adipose sac rests on the Colles' fascia (Fig. 3a, b). Therefore, there is a significant difference between the adipose tissue distribution in the labium majus and other parts of the body (Fig. 6a, b). The new anatomic structure of the adipose sac was discovered within the labium majus anatomy and was located in the subcutaneous stratum (Fig. 1a). Geometrically, the adipose sac was observed to be a reverse triangular, three-dimensional mass. The thickness of the sac progressively sloped down toward the inguinal area. Basically, the adipose sac wall presented as a fibroadipose anatomic structure that was filled with adipose tissue.

Table 2 Demographics

Demographics	Subject no. 1	Subject no. 2	Subject no. 3
Age (years)	42	38	46
Education	College degree	High school diploma	College degree
Vaginal parity	3	2	2
Marital status	Married	Married	Single
Comorbidity	None	None	None
Prior surgery	C/S	None	Abdominal hysterectomy without BSO
Current medication	None	None	None
BMI (kg/m^2)	27	23	21

BMI body mass index, *BSO* bilateral salpingo-oopherectomy

The demographics of the living subjects in this study were very compatible (Table 2). Each subject demonstrated acquired anatomic skin with multiple depressions or dents, skin folds with deep wrinkles, flattened configuration, and sagging skin of the labium majus. These aberrations make the labia majora look older than the biological age of the subject. These aesthetic aberrations were more pronounced, with a tendency to droop down and a thicker than expected appearance of the labia majora, when the subjects were in a sitting position. An unnatural anterior commissure gap was also identified (Fig. 1a). Preoperatively, all subjects presented with the chief complaint of labia majora anatomic disfigurement (Fig. 1a, b). The subjects described their labium majus disfigurements as sagging, drooping, baggy, flattened, and wrinkled skin with retraction causing an uneven appearance of the skin surface. All anatomic disfigurements were confirmed upon physical examination (Fig. 1a, b). Those changes caused not only aesthetic concerns but also anxiety and fear of being sexually inadequate and these concerns led to social phobia. Intact peripheral nerve endings were observed in all subjects before and 6 months after surgery. Postoperatively, the validated Body Image Scale improved in each subject (Table 1).

The primary outcome measure established the applicability of labium majus labiopexy and/or labioplasty for the restoration of the labium majus from acquired anatomic disfigurement in all subjects of the study without any technical difficulty and without any intraoperative or postoperative short- or long-term complications being observed. On the average, labiopexy was performed bilaterally within 47 min (range = 39–55) under local anesthesia. The secondary outcome measure determined that both new surgical interventions resolved aesthetic concerns and improved self-perceived body image in all subjects (Table 1). Also, the fear of being sexually inadequate subsided. All subjects engaged in vaginal sexual intercourse 6 weeks after surgical intervention.

At the 6-month postoperative clinical evaluation, sensation in the nerve endings of the labium majus was intact. Subjects reported significant improvement of the aesthetic look of their labia majora with well-hidden postoperative scars (Fig. 5b).

Discussion

A new concept of two surgical techniques was developed, based upon fat tissue compression within the labium major adipose sac. Reconstruction of the labium majus adipose sac (labioplasty) and/or of the Colles' fascia (labiopexy) was the fundamental principle of these new techniques. In this author's view, the labium majus compacted adipose tissue is maintained by three independent factors: the turgor of the cutis tissue, the intact adipose sac's wall, and the strength and tension of Colles' fascia. In general, the procedure should restore a semiballoon appearance, reduce wrinkles, and reduce irregularity of the labium majus. To accomplish labium majus rejuvenation, the anatomic laxity of Colles' fascia must be reduced surgically, if present (labiopexy), the adipose sac site-specific defects should be reconstructed (labioplasty), if present, and the excessive skin without the adipose tissue must be trimmed.

This study is important for several reasons: (1) It established that an accurate understanding of the labium majus anatomy is necessary to develop reliable surgical interventions. (2) It determined that restoration of acquired labium majus abnormal configurations must be in harmony with the accurate anatomy. (3) It found that minimizing or eliminating women's aesthetic concerns improves her physical, emotional, and social well-being. (4) It documented that applying adequate surgical interventions improves self-perceived body image. (5) The study's findings can be utilized in a future clinical research. Also, the strength of the new labium majus labiopexy and labioplasty techniques cannot be overlooked for their simplicity and low rate of potential complications, at least in this group. Surgical outcomes of labiopexy and labioplasty compare very favorably with the existing labium majus labioplasty technique. The traditional labium majus labioplasty concept is based on trimming the excessive skin together with the underlying fat tissues [2, 3]. Such an approach will inadvertently make the labium majus appear flat, which will change the natural look of the labia. There is very little, if any, similarity between labium majus rejuvenation by labiopexy and/or labioplasty and the traditional labium majus labioplasty technique [2–7]. With the new techniques, only the skin is trimmed without

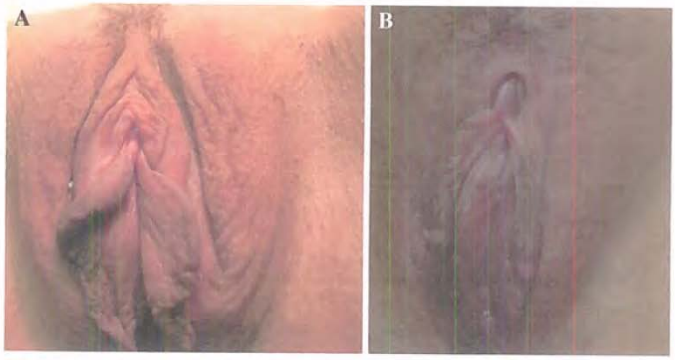

Fig. 5 **a** The labia majora before labiopexy and labioplasty. **b** The labia majora 1 year after bilateral labiopexy and labioplasty. Skin irregularities, wrinkles, skin retraction, bumpy appearance, sagging, drooping, and baggy and flatten look were corrected by the labiopexy and labioplasty procedures. Also, clitoral hoodoplasty, clitoral preputial reconstruction, and labia minora labioreduction were performed

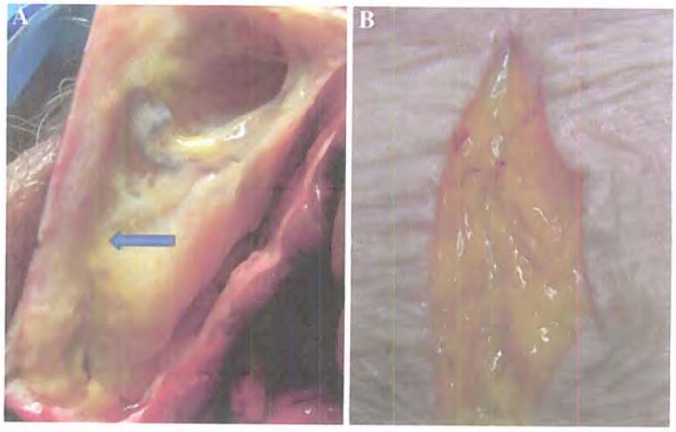

Fig. 6 **a** The labium majus looks like a baggy reverse triangle. The adipose sac loosely fused with the skin of the labium majus (the *arrow*). Above and below the *arrow*, adipose sac defects are seen. **b** The same subject's abdominal midline fat distributions for comparison with the labium majus (courtesy of Ostrzenski's fresh cadaver labium majus anatomic study used with permission)

removing the underlying adipose sac wall tissues. So far, no single surgical intervention has been published in which the Colles' fascia was reconstructed and/or the adipose sac was restored.

The World Health Organization (WHO) defines health as "not merely the absence of disease; it also encompasses an individual's physical, social, and emotional well-being" [9]. In most instances, the negative body image caused by the appearance of a female's genitalia will worsen the overall quality of life that includes physical, social, and/or emotional components with the absence of disease. All three parameters must be taken into account to provide a patient with satisfactory medical care.

The limitation of this study was the small size of the surgical sample, which could increase chances of an error. Also, modification of the Body Image Scale questions to tailor them to relate to the labium majus acquired disfigurements could decrease the scale's ability to detect a difference when it existed. The strength of this study is the discovery of an adipose sac as an anatomic structure within the labium majus (Fig. 6a), and documented improvement of self-perceived body image after labiopexy and/or labioplasty. Such findings strongly suggest that new labiopexy and labioplasty procedures could play a major role in the surgical treatment of labium majus disfigurements. Surgically, it is easy to increase the tension of the Colles' fascia, to reconstruct site-specific adipose sac defects, and to trim skin without partially removing the adipose sac with the fat tissue. Labiopexy and/or labioplasty were performed on each subject in this study and provided very pleasing aesthetic outcomes (Figs. 4b, 5b), with resolution of the subjects' aesthetic concerns and improvement of self-perceived body image.

Increased body mass index usually results in large fat deposits in the labia majora, causing enlargement, hygiene issues, discomfort, and aesthetic concerns. With weight loss, most of these deformities persist [10]. Whether there is a direct or an indirect connection between hormonal deficiency and skin aging still remains an open question. Hormones have been shown to influence skin morphology

and function, skin permeability, wound healing, lipogenesis, and the metabolism of skin cells. Prevention of skin aging by estrogen/progesterone replacement therapy is effective if administered early after menopause. Systemic estrogen replacement therapy (ERT) has been shown to improve some aspects of skin aging. Estrogen restores skin thickness by increasing collagen synthesis while limiting excessive collagen degradation. Wrinkling is decreased following estrogen treatment since estrogen enhances the morphology and synthesis of elastic fibers, collagen type III, and hyaluronic acid [8, 11, 12]. Dryness is also alleviated through increased water-retention capacity, increased sebum production, and improved barrier function of the skin. Furthermore, estrogen modulates local inflammation, granulation, re-epithelialization, and possibly wound contraction, which collectively accelerate wound healing at the expense of forming lower-quality scars [13]. Despite its promises, long-term ERT has been associated with harmful systemic effects [8, 9]. Vitamin D supplementation and antioxidant treatment may also be beneficial. Replacement therapy with androgens, growth hormone, IGF-1, progesterone, melatonin, cortisol, and thyroid hormones still remains controversial [13].

Conclusions

The labium majus adipose sac is present in each woman. Intraoperatively, newly developed labium majus labiopexy and/or labioplasty do not create technical problems. Self-perceived body image improves and sensation of nerve endings is intact after labiopexy or labioplasty.

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Conflict of interest The author declares that he has no conflicts of interest to disclose.

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