Since the introduction of thread-lift sutures, its application has gradually spread among many cosmetic medical specialists (such as plastic surgeons and maxillofacial surgeons) and cosmetic doctors (medical doctors and dentists specialized in noninvasive aesthetic treatments such as botulinum toxin type A and filler injections), with the main indication of lifting sagged tissues by means of a minimally invasive closed procedure. Its application is claimed to be easy after proper training, and it is suggested to be a good alternative for surgical lifts because it is a significantly less invasive procedure. Many colleagues used the technique in the early 1990s but stopped doing so because of disappointing results. Currently, more and more cosmetic doctors offer the procedure; this is the next group of cosmetic treatment providers that will experience the true value of thread-lift sutures. The cosmetic industry has flooded the market with a vast

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**Background:** In 2006, Villa et al. published a review article concerning the use of thread-lift sutures and concluded that the technique was still in its infancy but had great potential to become a useful and effective procedure for nonsurgical lifting of sagged facial tissues. As 11 years have passed, the authors now performed again a systematic review to determine the real scientific current state of the art on the use of thread-lift sutures.

**Methods:** A systematic review was performed according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines using the PubMed database and using the Medical Subject Headings search term “Rhytidoplasty.” “Rhytidoplasty” and the following entry terms were included by this Medical Subject Headings term: “facelift,” “facelifts,” “face Lift,” “Face Lifts,” “Lift,” “Face,” “Lifts,” “Platysmotomy,” “Platysmotomies,” “Rhytidectomy,” “Rhytidectomies,” “Platysmaplasty,” and “Platysmaplasties.” The Medical Subject Headings term “Rhytidoplasty” was combined with the following search terms: “Barbed suture,” “Thread lift,” “APTOS,” “Suture suspension,” “Percutaneous,” and “Silhouette suture.” RefWorks was used to filter duplicates. Three of the authors (H.A.G., B.C., and B.L.) performed the search independently.

**Results:** The initial search with all search terms resulted in 188 articles. After filtering the duplicates and the articles about open procedures, a total of 41 articles remained. Of these, the review articles, case reports, and letters to the editor were subsequently excluded, as were reports dealing with nonbarbed sutures, such as Vicryl and Prolene with Gore-Tex. This resulted in a total of 12 articles, seven additional articles since the five articles reviewed by Villa et al.

**Conclusions:** The authors’ review demonstrated that, within the past decade, little or no substantial evidence has been added to the peer-reviewed literature to support or sustain the promising statement about thread-lift sutures as made by Villa et al. in 2006 in terms of efficacy or safety. All included literature in the authors’ review, except two studies, demonstrated at best a very limited durability of the lifting effect. The two positive studies were sponsored by the companies that manufacture the thread-lift sutures. (Plast. Reconstr. Surg. 141: 341e, 2018.)
array of different types of so-called thread-lifting sutures. Substantial amounts of marketing budget have been allocated by these companies to “train” physicians in this procedure. These commercial incentives in combination with enthusiastic cosmetic professionals are mainly responsible for the extensive spread of this supposed minimally invasive lifting procedure.

In 2006, Villa et al. published a review article concerning the use of thread-lift sutures for midface elevation.1 The authors concluded that the technique was still in its infancy, but that it had the potential to become a useful and effective procedure as further innovations were made. As 11 years have passed, and based on personal experience with thread-lift sutures, we were curious about the real scientific state of the art on the use of thread-lift sutures and therefore performed a systematic review on this topic.

PATIENTS AND METHODS

A systematic review was performed according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines using the PubMed database and the Medical Subject Headings search term “Rhytidoplasty.” “Rhytidoplasty” is defined as plastic surgery performed, usually by excision of skin, for the elimination of wrinkles from the skin. The term was introduced in 1989. The following entry terms are included by this Medical Subject Headings term: “facelift,” “facelifts,” “face Lift,” “Face Lifts,” “Lift,” “Face,” “Lifts,” “Platysmatomy,” “Platysmatomies,” “Rhytidectomy,” “Rhytidectomies,” “Platysmaplasty,” and “Platysmaplasties.”

The Medical Subject Headings term “Rhytidoplasty” was combined with the following search terms “barbed suture,” “Thread lift,” “APTOS,” “Suture suspension,” “Percutaneous,” and “Silhouette suture.” RefWorks (ProQuest, Ann Arbor, Mich.) was used to filter duplicates. Three of the authors (H.A.G., B.C., and B.L.) performed the search independently.

As we focused on closed procedures, we eliminated any article describing open procedures in combination with thread-lift sutures during a first search. Subsequently, all review articles, technical reports, case reports, and letters to the editor were withdrawn in a second search. Eventually, all articles dealing with nonbarbed sutures, such as Vicryl on a Gore-Tex patch, was also eliminated. Also, articles that did not mention a follow-up time were filtered out. Finally, 12 articles were considered for use in this review, of which five dated from before 2006 and were already discussed in the review article by Villa et al.1 As it was not our intention to replicate the findings reported by Villa et al., we focused on the most recent seven additional included articles (Table 1).

RESULTS

The initial search with all search terms resulted in 188 articles. After filtering the duplicates and the articles about open procedures, a total of 41 articles remained (Fig. 1). Of these, the review articles, case reports, and letters to the editor were subsequently excluded. This resulted in 24 articles to be included in further search and review (Fig. 2). During a more detailed review of these articles, any study that dealt with nonbarbed sutures, such as Vicryl on a Gore-Tex patch, was also eliminated. Also, articles that did not mention a follow-up time were filtered out. Finally, 12 articles were considered for use in this review, of which five dated from before 2006 and were already discussed in the review article by Villa et al. As it was not our intention to replicate the findings reported by Villa et al., we focused on the most recent seven additional included articles (Table 1).

Type of Suture

Four of five studies reviewed by Villa et al. used Aptos (Aptos International, Tbilis, Georgia) threads for closed suspension.1 These Aptos threads are no longer described in recent studies. Instead, Contour Threads (Angiotech Pharmaceuticals, Inc., Vancouver, British Columbia, Canada) are being described (in four of six studies).

Aptos Threads and Woffles Threads

The Aptos threads were described by Sulamanidze et al. in 2002 and are made of 2-0 polypropylene line with dents provided during the manufacturing process, thus creating slant edges with sharp ends.9 Woffles threads were described by Wu.10 We did not find any recent literature describing long-term results of these sutures.

Contour Threads (Nonresorbable)

Contour Threads were approved by the U.S. Food and Drug Administration in October of 2004. They consist of a 25-cm length of 2-0 polypropylene suture with a central 10-cm segment of 50 unidirectional helicoidally configured barbs (Surgical Specialties Corp., Reading, Pa.).
Multianchor Suspension Suture (Resorbable)
Eremia and Willoughby used a multianchor suspension suture assembled from 2-0 absorbable monofilament material, with five to nine equally spaced knots through which are secured 7- to 9-mm bits of similar suture material.²

Silhouette Soft
Poly-L-lactic acid, the principal component of Silhouette Soft (Sinclair Pharma, London, United Kingdom), is a well-known polymer that has been used for many years in a large number of biomedical and pharmaceutical applications. It is because
<table>
<thead>
<tr>
<th>Reference</th>
<th>Specialty of the Author</th>
<th>Device</th>
<th>No. of Patients</th>
<th>Follow-Up</th>
<th>Evaluation</th>
<th>Results</th>
<th>Complications</th>
<th>Disclosures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eremia and Willoughby, 2006</td>
<td>Dermatologist</td>
<td>Multianchor suspension suture</td>
<td>20 patients of which 14 underwent pure, “no-skin-excision,” suspension lifts</td>
<td>6–12 mo</td>
<td>Preoperative and postoperative photographs</td>
<td>With pure suspension lift; by 6 mo, correction started to fade; by 12 mo, 100% of initial correction for jowls, and 80 to 100% for midface, appeared lost; recovery time was 2–4 days</td>
<td>No significant complication</td>
<td>Nondisclosure</td>
</tr>
<tr>
<td>Kaminer et al., 2008</td>
<td>Dermatologist</td>
<td>Contour Threads</td>
<td>20 patients were mailed, 12 replied</td>
<td>Minimum 6 mo</td>
<td>Anonymous satisfaction survey</td>
<td>Satisfaction, 6.9; overall improvement, 4.6 (scale, 1–10)</td>
<td>Bruising, swelling, pinching</td>
<td>Grant from Angiotech (company makes Contour Threads)</td>
</tr>
<tr>
<td>Abraham et al., 2009</td>
<td>Otolaryngologist</td>
<td>Contour Threads</td>
<td>33 patients, of which 10 underwent thread lift alone; 23 in combination with other procedure; control group</td>
<td>12–31 mo</td>
<td>Blinded surgeon scoring an aesthetic grading scale</td>
<td>Overall aesthetic improvement 0.2–0.5, which implicates minimal improvement (scale, 0–3)</td>
<td>Skin dimpling, visible knots</td>
<td>Dr. Williams is a shareholder in the New England Laser and Cosmetic Surgery Center</td>
</tr>
<tr>
<td>Garvey et al., 2009</td>
<td>Plastic surgeon</td>
<td>Contour Threads</td>
<td>72 patients, of which 55 underwent a pure closed procedure</td>
<td>8.4 mo</td>
<td>Chart review</td>
<td>30 of the 72 patients (42.3%) underwent some form of revision surgery at an average of 8.4 mo</td>
<td>Swelling, ecchymosis, infection, thread extrusion, palpable threads, contour irregularity, and recurrent laxity</td>
<td>Unknown</td>
</tr>
<tr>
<td>Rachel et al., 2010</td>
<td>Plastic surgeon</td>
<td>Contour Threads</td>
<td>29 patients, of which 18 underwent a pure closed procedure</td>
<td>1–25 mo (average, 12 mo)</td>
<td>Nonblinded review of preoperative and postoperative photographs by surgeons and patients</td>
<td>50% recurrence of laxity within 6 mo; 14% already in the first 8 wk; 17 patients required second procedure during follow-up period</td>
<td>20 patients (69%): intractable pain, dimpling, visible and palpable thread, thread extrusion, paresthesia, foreign body reaction</td>
<td>Nondisclosure</td>
</tr>
<tr>
<td>de Benito et al., 2011</td>
<td>Maxillofacial surgeon</td>
<td>Silhouette Sutures</td>
<td>316 patients, 22 of which underwent a combined midface suture lift and endoscopic forehead lift or upper and/or lower blepharoplasty or neck lift</td>
<td>Maximum 3 yr (average 18 mo)</td>
<td>Preoperative and postoperative photographs</td>
<td>The results are relatively long-lasting with high levels of satisfaction among patients and surgeons</td>
<td>42 patients (13.3%): moderate pain in the temporal area (7%), visible dermal pinching (3.5%), hematoma in the temporal area (1.3%), asymmetry (0.6%), suture palpability (0.3%)</td>
<td>Dr. de Benito received consulting fees from Silhouette Lift company</td>
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</table>

(Continued)
this polymer is particularly biocompatible in the human body, and also completely biodegradable, that such applications have been developed. De Benito et al. used Silhouette sutures. They consist of a 37.3-cm length of 3-0 polypropylene suture with a central 8-cm segment of nine knots at approximately 10-mm intervals. Each knot is intercalated with an absorbable cone of poly-
lactic acid, making up a series of eight engaging elements.

**Polydioxanone Threads (Resorbable)**

Suh et al. used resorbable knotless polydioxanone threads. Cog polydioxanone threads have barbs, which stick to tissues when inserted and result in lifting. Depending on the direction of the spikes, cog polydioxanone threads are categorized as unidirectional, bidirectional, or multidirectional.

**Efficacy and Longevity**

Eremia and Willoughby stated that correction started to fade by 6 months after a pure suspension lift. By 12 months, 100 percent of the initial correction for jowls and 80 to 100 percent for midface appeared lost. Kaminer et al., in contrast, showed satisfaction scores of 6.9 on a scale of 1 to 10 and overall improvement scores of 4.6 on an anonymous satisfaction survey. Abraham et al. showed only a minimal overall aesthetic improvement scored by blinded surgeons on an aesthetic grading scale. In a study by Garvey et al., 30 of 72 patients (42.3 percent) underwent some form of revision surgery at an average of 8.4 months. Recurrent laxity was considered as an adverse event by this study group.

De Benito et al., however, showed good results with high patient satisfaction over a mean follow-up period of 18 months. All of the patients had stable results during the follow-up period.

Rachel et al. showed 50 percent recurrence of laxity within 6 months; 14 percent had already occurred in the first 8 weeks. Seventeen patients required a second procedure during the follow-up period. Suh et al. found 45 percent of patients with a fair or poor lifting effect.

**Adverse Events**

Swelling and bruising were identified as the most frequent complications. Three studies described visible and/or palpable threads. Skin dimpling and contour irregularities were noted as well. Two studies showed thread extrusion. Rachel et al. identified three additional complications (i.e., intractable pain, paresthesia,
and foreign body reaction). Other complications described were infection and mild asymmetry. Serious adverse events, including injury to the facial nerve, have not been reported.

**DISCUSSION**

This systematic review regarding the use of thread-lift sutures for closed minimally invasive lifting procedures in the face clearly demonstrates that, despite promising results suggested by preliminary results in the past, there is no substantial scientific evidence that thread-lift sutures have a long-lasting effect. Eleven years ago, Villa et al. concluded that the thread-lift suture lift technique was still in its infancy but suggested that it had the potential to become a very useful and effective clinical tool as further innovations were made. However, they also stated that future research concerning the thread-lift suture should consider objective, standardized photographic analysis of facial suspension at fixed intervals postoperatively in a double-blinded fashion.

Unfortunately, we have found only one such study using a control group for evaluation and a blinded surgeon scoring an aesthetic grading scale after the use of thread-lift sutures. The authors of this study concluded that the thread-lift provides only limited short-term improvement that may be largely attributable to postprocedural edema and inflammation.

Most other studies demonstrated only a limited effect and/or limited longevity. A study by Suh et al. showed that the thread lift was effective for uneven facial textures, slack midface, and minimal to moderate jowls in selected patients. However, the lifting effect was evaluated as fair to poor in 45 percent of patients. Eremia and Willoughby showed that correction started to fade by 6 months, and 80 to 100 percent of the correction appeared lost by 12 months. Garvey et al. found a high rate of revision procedures following a Contour Thread lift; in addition, the time to revision was found to be short. They concluded that the results achieved by the Contour Thread lift were subtle and short-lived and advocate that patients be educated about these limitations. A study by Rachel et al. similarly showed early recurrence and a high incidence of adverse events after Contour Thread placement and therefore do not recommend this technique. If patients would really understand this, they probably would not pay such an amount of money for a closed thread-lift suture lift that lasts for only a few months.

Thus far, only two studies showed promising results with a high satisfaction and overall improvement rate. Eremia and Willoughby showed an improvement of facial laxity up to 16 months after the procedure, with the most favorable effect seen in the tear trough/malar fat pads and nasolabial folds. However, it should be noted that this research group received a grant from Angiotech, the company that manufactures the Contour Threads. Also, de Benito et al. showed that thread-lifting procedures provide stable results with a high level of satisfaction among patients and surgeons. However, we have to also realize that de Benito et al. received consulting fees from the Silhouette Lift company for travel and hotel expenses associated with providing lecture and surgery workshops for the company.

Atiyeh et al. assessed in a review article not only evidence-based efficacy but also the general views expressed in the literature arising from empirical observation and opinion. They conclude that a surgical approach to redistribute the different anatomical layers of the face by standard open or endoscopic face lifts cannot be replaced by simply suspending ptotic tissue with threads like a marionette. In our review, we did not include articles about nonbarbed sutures, as one could expect an even less long-lasting effect with these sutures.

The overall reported rate of serious complications with thread-lift suture is low. There is, however, the potential for detrimental complication of nonreversible scarring after an infection with threads. Possible long-term damage to the delicate superficial musculoaponeurotic system layer caused by repetitive scarring must also be considered, as our first objective is to not do any harm to precious tissues. Cosmetic doctors using these techniques are mainly nonsurgeons who have not been “brought-up” with the principles of sterile techniques, and learn these procedures often in 1-day industry-sponsored courses.

Despite the lack of evidence for long-lasting results of closed thread-lift suture lift, its use is currently still very popular, probably driven by industry and money-driven cosmetic physicians promoting face-lift results without surgery, a fairy tale story many potential clients for facial rejuvenation wish to believe. Also, because these clients have already been successfully treated in the past by their cosmetic doctor with botulinum toxin type A and fillers, many of them also believe in the next step offered by them: the nonsurgical face lift using a closed thread-lift suture lift.

However, there may be significant advantages when thread-lift sutures are combined with an open procedure. For example, the multi-anchor thread-lift suspension sutures distribute...
tension more evenly among the lifted tissues.\textsuperscript{15} The microimbrication of a dissected layer, like the superficial musculoaponeurotic system, is subsequently locked by the overlying skin/dermal layer, thereby locking the “lift effect.” A variant of the thread-lift suture, the V-lock suture, is nowadays routinely used in closing wounds without knitting. As such, thread-lift sutures really can have a definite role in the future.

**CONCLUSIONS**

Based on clinical experience and the review of Villa et al. 11 years ago, the use of thread-lift sutures to perform a closed minimally invasive “face-lift procedure” was considered to be a very promising technique. However, our review clearly demonstrates that, in the past decade, little or no evidence has been added to the literature to support this statement. All included literature in this review except one study demonstrated very limited durability of the lifting effect. Only two studies, sponsored by the companies that manufacture the thread-lift sutures (Contour Threads and Silhouette sutures), reported positive results. A limited direct lift effect with short longevity is our main conclusion of this systematic review of the closed thread-lift suture lift in the face. Only the use of thread-lift sutures in combination with an open procedure seems to be promising.

**REFERENCES**