

# Deep Tissue Sculpture in Neck Rejuvenation: Review of 641 Consecutive Cases

Samir M. Ghoraba, MD, MRCS

**Background:** Enhancing neck contour is a primary goal for individuals seeking facial and neck rejuvenation. However, the literature on deep neck sculpture and its potential complications is scarce.

**Methods:** The records of 641 patients with deep plane neck lift and deep tissue sculpture were reviewed retrospectively between 2014 and 2023. The surgical techniques used by the author were addressed comprehensively and supplemented with videos. The outcomes and complications were reported.

**Results:** A total of 1861 consecutive patients underwent deep plane facelift. Of these, 641 patients (34.4%) underwent deep neck surgery, with an average age of 52 years; 14.6% were men, and 29% were smokers. A total of 12.3% experienced complications after deep neck sculpture. The most common complications were subcutaneous serous collection (4.3%), followed by marginal mandibular neuropraxia (3.3%) and hematomas (2.96%). Parotid sialocele was the least frequent complication among enrolled patients (0.3%).

**Conclusions:** Deep neck sculpture presents an effective and safe technique for patients seeking neck rejuvenation. (*Plast Reconstr Surg Glob Open* 2024; 12:e6364; doi: 10.1097/GOX.00000000000006364; Published online 19 December 2024.)

## INTRODUCTION

The neck contour and the cervicomenal angle are crucial determinants of a youthful face. Loss of the distinction between the neck and the face is a hallmark of aging.<sup>1</sup> It is worth noting that the most common cause of facelift revisions in the first 2 years is failed neck treatment.<sup>2,3</sup>

Successful neck rejuvenation mandates meticulous appraisal of all layers of the neck, including superficial, intermediate, and deep layers. Targeted neck surgery would decrease the incidence of revision rate.<sup>4</sup> Nevertheless, deep tissue sculpture is a controversial technique among facial aesthetic surgeons. This is seemingly due to concerns about potential complications and technical difficulties.<sup>5</sup>

A few case series reported various deep neck sculpture techniques and their potential complications.<sup>5</sup> Accordingly, this study aimed to address the author's deep neck sculpture technique and report its potential complications.

## PATIENTS AND METHODS

This is a retrospective study of all patients who underwent deep neck sculpture between May 2014 and December 2023. Ethical approval was obtained from the Tanta University Research Committee (36264PR674/5/24). In addition, all procedures were performed in accordance with the ethical standards of the Tanta University Research Committee and with the Declaration of Helsinki and its later amendments or comparable ethical standards.<sup>5,6</sup>

The study enrolled patients with deep plane face and neck lift, and deep tissue sculpture. We excluded those with unrealistic expectations, a body mass index more than 32 kg/m<sup>2</sup>, or a history of permanent filler injection. The deep tissue sculpture technique included reducing the submandibular salivary glands, linear debulking of the anterior bellies of the digastric muscles, and contouring of the central and interplatysmal fat in addition to deep lateral neck fat (Fig. 1).

## SURGICAL TECHNIQUE

A submental incision 2–3 cm was placed at the inner border of the palpable chin bone, and the incision planning was irrelevant to the submental crease. Thus, the

From the Plastic and Reconstructive Surgery Department, Tanta University, Tanta, Egypt.

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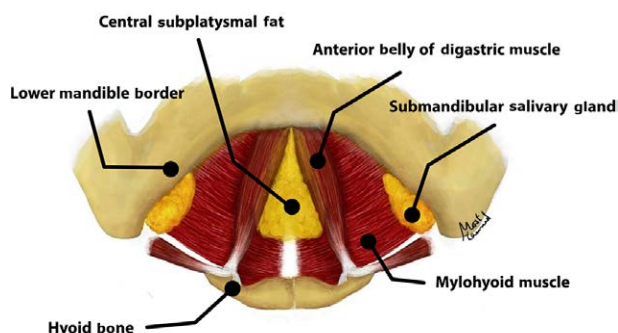
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submental incision was either within or posterior to the submental crease. The skin flap was sharply dissected off the underlying platysma through the incision. The subcutaneous dissection extended 2 cm lateral to the midline on each side. Then, the medial platysmal edges were identified immediately or, in patients with thick necks, after the removal of a thin layer of superficial fat. After that, the midline platysmal decussation was sharply incised with the Bovie cautery in blend mode. The dissection continued on the undersurface of the platysma on each side until the lateral pad of fat was encountered with sufficient lateral retraction of the platysma. Interplatysmal and subplatysmal fat were removed with the preservation of adequate fat on the mylohyoid between the anterior bellies of the digastric muscles. Judicious reduction of the interdigastic fat is fundamental to avoid a skeletonized look of the neck (Fig. 2).

Afterward, the anterior bellies of digastric muscles become easily identifiable after contouring the central fat. Fat lateral to the anterior bellies of digastric muscles was sharply separated off the thin capsule of the submandibular salivary glands. Intracapsular piecemeal reduction of the submandibular salivary glands was performed using bipolar and monopolar diathermy with gentle traction on the glands by Debaquey forceps. (See Video 1 [online], which displays the reduction of submandibular salivary glands using bipolar and Bovie diathermy.) The glands were reduced to the level of the mandibular border, which was confirmed by digital palpation. Meticulous hemostasis was achieved using bipolar diathermy. The decision of the submandibular gland reduction was always made during the surgery. Nevertheless, prediction was made preoperatively by asking the patients to push their tongue toward the upper incisors while palpating the submandibular gland at the submandibular triangle. Patients with palpable glands are usually candidates for submandibular reduction.

Furthermore, linear reduction of the massive anterior bellies of the digastric muscles was performed using monopolar diathermy in blend mode. (See Video 2 [online], which displays the linear reduction of the anterior belly of the digastric muscle.) Transverse scoring of the prehyoid fascia was performed to deepen the cervicomenal angle



**Fig. 1.** Diagrammatic illustration of structures addressed in deep neck sculpture including submandibular salivary glands, interdigastic fat, anterior belly of digastric muscle.

## Takeaways

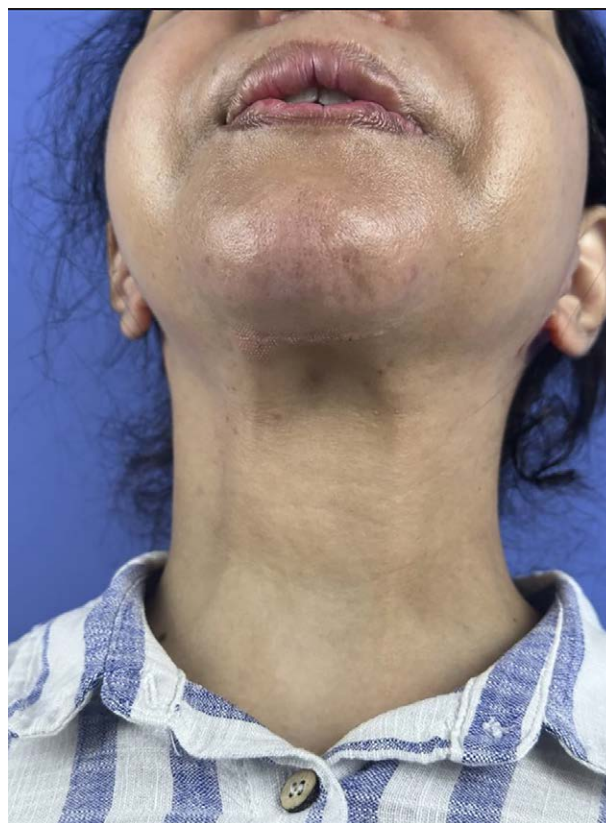
**Question:** What are the risks and outcomes of deep tissue sculpture in neck rejuvenation?

**Findings:** A retrospective study on a large cohort of 641 patients explored the effectiveness, and the potential complications of deep tissue sculpture in neck rejuvenation. No permanent complications were reported as a result of deep neck sculpture.

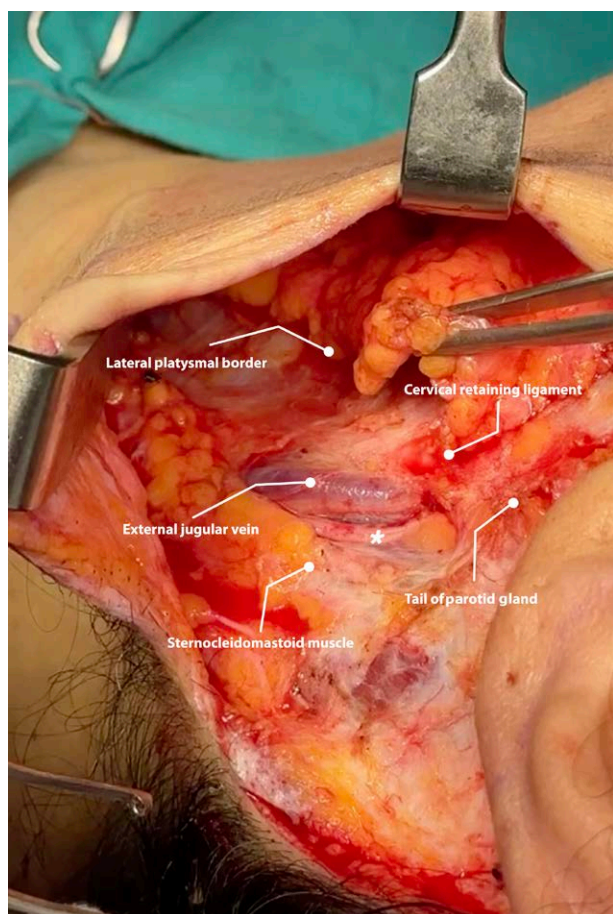
**Meaning:** The study confirmed the safety and effectiveness of deep tissue sculpture in neck rejuvenation.

when needed. The 2-0 Vicryl suture was used to suture the anterior bellies of the digastric muscles together just above the hyoid bone. Meticulous hemostasis was ensured at this point. Then, the medial edges of the platysma were sutured in the midline using 2/0 Vicryl suture starting from the level of the hyoid bone all the way up to the submental incision. No sutures were applied below the level of the hyoid bone.

Through a standard facelift incision, a deep plane was entered through a line extending from the lateral canthus to the angle of the mandible in the face; the lateral platysmal edge was sharply dissected off the anterior border of the sternomastoid with great caution to protect the external jugular vein and the great auricular nerve (Fig. 3).



**Fig. 2.** Skeletonized look of the neck due to over-resection of interplatysmal fat.



**Fig. 3.** Releasing the lateral platysmal edge off the sternomastoid border and protection of the great auricular nerve. \* indicates the great auricular nerve.

The superficial musculoaponeurotic system platysmal flap was bluntly dissected until the facial pulsation is detected in the field. (See Video 3 [online], which displays the extent of anterior dissection and identification of the facial pulsation.) The tail of the parotid was mobilized off the mastoid process to deepen the gonial angle. The platysma was anchored to the mastoid fascia using 0 Vicryl suture after vertical vectoring. A suction drain was routinely placed deep to the platysmal flap, and no dressing was applied. All the patients were admitted for the first 24 hours postoperative for early detection of complications and monitoring of the blood pressure.

Demographic and clinical data were recorded, including age, sex, smoking, average follow-up period, and complications. Standard photographs were taken one day after surgery and at different stages of healing. Patient satisfaction was assessed over the follow-up period.

### STATISTICAL ANALYSIS

Statistical analysis was conducted using the IBM SPSS computer program (version 26.0, Armonk, NY). Categorical variables were expressed in numbers and

**Table 1. Complications Among Patients Who Underwent Deep Neck Sculpture**

Deep Neck Sculpture Complications	No. Patients (%), N = 641
Subcutaneous serous collection	28 (4.3)
Marginal mandibular neuropraxia	21 (3.3)
Hematomas	19 (2.96)
Submandibular sialocele	9 (1.4)
Hematomas mandating reoperation	7 (1.1)
Parotid sialocele	2 (0.3)

percentages. Numerical data (follow-up duration) were expressed as a range (minimum–maximum).

### RESULTS

Between 2014 and 2023, a total of 1861 consecutive patients underwent deep plane facelift. Of them, 641 patients (34.4%) underwent deep neck surgery, and 354 (19%) underwent a secondary facelift. The enrolled patients (n = 641) were aged from 34 to 76 years, with an average age of 52 years  $\pm$  8.8 SD. Of them, 92 (14.6%) were men, and 186 (29%) were smokers. The follow-up period varied from 14 days to 9 years, with an average of 29 months  $\pm$  11.9 SD.

All the patients enrolled in the study had reduction of the submandibular gland and mobilization of the parotid of the mastoid process. Nevertheless, the reduction of the central fat was performed in 21% of the patients, whereas the frequency of the linear reduction of the anterior bellies of the digastric muscles was 57%.

After deep neck sculpture surgery, 79 patients (12.3%) experienced complications (Table 1). The most frequent complication observed was subcutaneous serous collection (4.3%). Among these patients, 19 (67.8%) were treated with needle aspiration and compression, whereas 9 (32.1%) required reinsertion of a suction drain for 7–10 days. All collections were resolved by the third week postoperative.

In Figure 4, a patient presented with subcutaneous seroma in the neck 1 week postoperative. With repeated aspiration, a complete resolution was seen by the third week after surgery.

Additionally, marginal mandibular neuropraxia was the second most reported complication among patients who underwent deep neck sculpture (3.3%). However, no patients had permanent damage to the marginal mandibular nerve. All neuropraxia resolved completely within 6 months with no residual deficit. (See Video 4 [online], which displays the marginal mandibular nerve deficit immediately postoperative and 2 months postoperative.)

Moreover, hematomas were reported in 19 patients (2.96%). Seven of those 19 patients (1.1%) required reoperation and surgical control. Of those 7 patients, 5 patients (71.4%) were men with heavy necks, and 4 (57.1%) had difficult revisions. The surgical exploration revealed that the stump of the submandibular gland was the source of bleeding in 3 patients. The 3 patients were diagnosed in the first 12 hours postoperative.





**Fig. 4.** Postoperative subcutaneous seroma in a patient who underwent deep neck sculpture: before (A) and after repeated aspiration (B).

Case 1 was a 66-year-old hypertensive male patient who presented with an expanding painful swelling at the right side of the neck 7 hours postoperative. The patient was hemodynamically stable with no respiratory distress, and his blood pressure was 120/90 mm Hg. It is noteworthy that his systolic blood pressure did not exceed 120 mm Hg before or during the surgery. He was managed by surgical exploration through the submental incision, revealing active bleeding from the stump of the right submandibular gland. Meticulous hemostasis was performed using the bipolar diathermy after irrigation with warm saline.

Case 2 is a 57-year-old female patient with no history of hypertension or coagulopathies. She presented with a sudden painful swelling in the right side of the neck 7 hours postoperative. On examination, she was hemodynamically stable with no respiratory distress. The swelling was small and she was managed conservatively and monitored for 6 hours. Thirteen hours postoperatively, examination revealed a significant increase in swelling size, denoting active bleeding, yet she was hemodynamically stable with no respiratory distress. She was treated by surgical exploration and control of the bleeding from the remnant of the right submandibular gland.

Case 3 is a 55-year-old male patient with no history of hypertension or coagulopathies. The patient had a history of previous neck lift. He presented with a rapidly increasing painful swelling in the left side of the neck 5 hours postoperatively. On examination, he was hemodynamically stable with no respiratory distress, and his blood pressure was 130/80 mm Hg. Surgical exploration denoted 2 bleeders from the remnant of the left submandibular gland. Dedicated hemostasis was performed after repeated irrigation with warm saline.

In addition, 1 patient developed a massive hematoma 6 hours after surgery. Urgent exploration revealed the source of bleeding was underneath the superficial musculoaponeurotic system flap in the midface. Thus, repeated washing with warm saline and meticulous hemostasis were performed.

Moreover, submandibular sialoceles occurred in 9 (1.4%) patients. All cases were managed conservatively through repeated needle aspiration and local compression with bolster dressing. Tiemonium methylsulfate 50 mg was prescribed to the patients 3 times per day. However, no botulinum toxin was used in this series. Finally, all cases were resolved within 2–4 weeks of the aforementioned conservative measures.

On the other hand, parotid sialoceles were quite rare and reported only in 2 (0.3%) patients. These patients were also treated conservatively with compression and repeated needle aspiration. One of them was completely treated after 1 week, whereas the other patient needed 5 weeks for complete resolution. None of the patients experienced permanent dryness of the mouth.

On final assessment of patient satisfaction after 29 months of follow-up in average, 88% of the patients reported their improvement as very good or beyond expectation, whereas 12% of the patients indicated disappointment. [Figures 5](#) and [6](#) show the late results of 2 patients with heavy neck after deep neck sculpture.

## DISCUSSION

The paramount importance of neck contour cannot be more emphasized in terms of facial aesthetics. Deep neck sculpture is not extensively reported in the



**Fig. 5.** Two-year results after deep neck sculpture. A, Lateral view of a patient who presented with thick neck. The central subplatysmal fat was sculpted, and a linear reduction of the anterior bellies of the digastric muscles was performed. In addition, the submandibular glands were reduced to the level of the lower mandibular border. B, Lateral view of the same patient, 2 years after surgery. C, Frontal view of the patient before surgery. D, Frontal view of the same patient, 2 years after surgery.

literature. A few studies demonstrated the outcomes and complications of submandibular gland reduction; however, the number of enrolled patients was relatively small.<sup>6–8</sup> The reluctance to widen adoption of deep neck sculpture may be explained by the apprehension of the potentially serious complications and the need of additional operative time.

With aging, lengthening and attenuation of the retaining ligaments in the face and the neck occur, resulting in the descent of the medial edges of the platysma and maybe ptosis of the submandibular salivary glands. Nevertheless, the definite pathogenesis of submandibular gland prominence has not been identified and could be attributed to glandular hypertrophy instead of ptosis. Gland resection

bestows much better aesthetic outcomes when compared with direct glandular suspension and platysmal plication over the gland.<sup>6,7</sup>

This retrospective study reports the outcomes and complications of 641 patients who had deep neck sculpture. The performed procedure included reduction of the submandibular salivary glands, linear debulking of the anterior bellies of the digastric muscles, and contouring of the central and interplatysmal fat in addition to deep lateral neck fat.

Concerning the complications after the deep neck sculpture, in our study, 12.3% of patients experienced complications. Subcutaneous serous collection was the most commonly reported complication in 4.3% of



**Fig. 6.** Three-year results after deep neck sculpture, and face and neck lift revision. A, Lateral view of a patient who presented with pixie deformity, and thick lax neck 2 years after previous facelift surgery. The central and the lateral subplatysmal fat was sculpted, and a linear reduction of the anterior bellies of the digastric muscles was performed. In addition, the submandibular glands were reduced to the level of the lower mandibular border. B, Lateral view of the same patient, 3 years after surgery. C, Frontal view of the patient before surgery. D, Frontal view of the same patient, 3 years after surgery.

patients. Aspiration of clear amylase-free fluid confirmed the diagnosis and excluded sialoceles. Seroma collection could be attributed to the extensive deep tissue work, thus lengthening the initial recovery period. All patients who developed seromas were diagnosed in the first week after surgery. They were expectantly treated by repeated aspirations and compressions. Six patients had subcutaneous drains reinserted. All seromas were completely resolved 21 days after surgery, with an average resolution time of 12 days postoperative  $\pm$  4.9 SD.

In contrast to our findings, Mendelson and Tutino<sup>8</sup> did not report any seroma collection in the 112 patients who underwent submandibular gland reduction in the aesthetic rejuvenation of the neck. This could be explained by the smaller number of patients compared with this study. In another study (n = 600) conducted from 2007 to 2012, liposuction was performed on many

body parts, including the upper neck and lower face; seromas were one of the most observed complications, similar to our results. However, it was encountered for only 3.5% of their patients. They were also detected by the first-week postsurgery and resolved within 7–10 days.<sup>9</sup> In our study, seromas were managed by needle aspiration and compression in the majority of cases or by suction drain reinsertion.

Neuropraxia of the marginal mandibular nerve occurred in 3.3% of patients in the current study, with no reports of permanent injury. In accordance with our study, neuropraxia with no permanent damage of the marginal mandibular was reported to have a similar incidence.<sup>8,10,11</sup> The intracapsular dissection minimized the risk of nerve injuries. Management of neuropraxia consisted of reassurance and prescription of neurotonics. Full nerve function was recovered more than 3–6 months after surgery.

Major hematoma formation in closed neck spaces is the most fearful complication. The incidence of hematoma mandating reoperation in conventional neck rejuvenation without deep neck sculpture is less than 1%. In our experience, approximately 2.9% of patients developed hematomas, with 1.1% requiring reoperations. It was estimated that the risk of major hematomas was 1.1%, which is close to hematoma risk after conventional neck rejuvenation without deep sculpture.<sup>12,13</sup> Other studies reported a close incidence of 1.5%–1.8% of major hematoma formation that required reoperation, which is significantly higher when compared with this study.<sup>8,14,15</sup> However, a prior study conducted for subplatysmal neck lift (n = 504) reported no cases of subplatysmal hematoma. The reason for the absence of hematoma could be due to the application of a hemostatic net by placing continuous sutures over the submandibular salivary gland resection and at the closure site of the dissected space.<sup>10</sup>

Nevertheless, major hematomas after deep neck work could be life-threatening and are managed as a surgical emergency. The deep location at the closed neck space would lead to airway compromise. Exploration of the 7 patients revealed the source of bleeding to be the remnant of the submandibular gland in only 3 patients. The mitigation of the bleeding risk cannot be overlooked. Blood pressure monitoring and control before and after surgery is crucial. The systolic blood pressure was kept at 120 mm Hg or below. Absolute meticulous hemostasis is crucial before suturing the medial platysmal edges. Close monitoring for the first 24 hours was important to detect hematoma formation. Notably, all hematomas mandating reoperation were detected within the first 24 hours after surgery. A systematic review reported that the most effective methods to reduce bleeding are managing perioperative blood pressure, tranexamic acid, and tissue sealants.<sup>16</sup>

As seen in our study, the incidence of sialocele formation after submandibular gland reduction was 1.4%, which was less than half the incidence reported by Mendelson and Tutino,<sup>8</sup> 4.5%. This could be attributed to the intraoperative injection of botulinum toxin into the gland remnants. Sialocele formation was confirmed by aspiration and amylase analysis. Management of sialocele consisted of repeated aspiration, bolster dressing applications, and the prescription of 50 mg of tiemonium methylsulfate 3 times per day. All sialocele were resolved within 2–4 weeks of conservative measures. The resolution time of submandibular sialocele is in accordance with other sialocele reports after aesthetic reduction of submandibular salivary glands.<sup>8,17–19</sup>

Finally, parotid sialocele was quite rare in our study, with an incidence of 0.3%. This could be explained by the very minimal manipulation of the parotid glands with no removal of parts of the gland substance. Yet, the capsule was opened to mobilize the tail of the parotid off the mastoid process. Postoperative xerostomia was a serious potential complication. However, no patient reported postoperative mouth dryness. This incidence was confirmed by recent reports of more than 100 patients without dry mouth after aesthetic salivary gland reduction.<sup>11,20–23</sup>

In this study, 88% of the patients reported their improvement as very good or beyond expectation,

indicating higher patient satisfaction when compared with previous studies of deep neck lift without deep tissue sculpture.<sup>11,21</sup> This could be explained by the dedicated treatment of every single component of the aged neck including submandibular salivary glands, anterior bellies of the digastric muscles, central fat, and lateral fat.

The submandibular gland comprises 25% of the volume in the aged neck.<sup>24</sup> Failure of proper assessment and treatment of the submandibular salivary gland would result in suboptimal results. Our study emphasized the safety and explored the potential complications of the submandibular gland reduction in a large cohort.

Our findings were limited by the study's nature. Being a single-arm retrospective study, it does not lead to adjusting other potential confounding variables that may influence the results. Therefore, a large, well-designed prospective study is required to investigate the true complication rates of deep neck sculpture in relation to other techniques.

## CONCLUSIONS

In conclusion, deep neck sculpture, in addition to appropriate vectoring and fixation of the platysmal flap to the mastoid process, bestows an effective neck rejuvenation with minimal incidence of complications. Seroma formation was the most frequent complication, which lengthened the initial recovery period. Despite infrequency, major bleeding could be serious and must be managed as a surgical emergency. The absence of permanent complications in this series could help relieve the concerns about the safety of the deep neck sculpture procedure.

**Samir M. Ghoraba, MD, MRCS**

Plastic and Reconstructive Surgery Department  
Tanta University

The Corner Mall, 2nd Floor

First Settlement, New Cairo 31111, Egypt

E-mail: [Samir.ghoraba@yahoo.com](mailto:Samir.ghoraba@yahoo.com)

## DISCLOSURE

*The author has no financial interest to declare in relation to the content of this article.*

## PATIENT CONSENT

*Informed consent was obtained from all individual participants included in the study.*

## ETHICAL APPROVAL

*Ethical approval was obtained, and all procedures performed in this study were in accordance with the ethical standards of the Tanta University research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. The Human Investigation Committee (institutional review board) of Tanta University approved this study.*

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