High-Resolution Ultrasound for Diagnosing and Managing Complications Arising from Thread Lift Procedures

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Abstract: Facial rejuvenation with thread lift is a minimally invasive procedure that is increasingly being utilized due to its tightening and collagen-stimulating effects. Despite its advantages, it is not exempt from the development of complications, including visible or palpable threads, nodules, fistulas, granulomas, thread extrusion, hematomas, and sunken cheeks, among others. Accurate diagnosis and management can benefit from high-resolution ultrasound exploration, which allows for precise determination of the complication type and provides anatomical information essential for its management. In this publication, we present a review of the characteristic ultrasonographic aspects of these complications.

Keywords: Threads, High-Resolution Ultrasound, Granulomas, Nodules, Fistulas.

INTRODUCTION

Facial rejuvenation with thread lift is a minimally invasive procedure involving the implantation of sutures beneath the skin's surface, creating a vectorial network aimed at improving skin laxity and texture, repositioning facial tissues, and addressing observed sagging due to normal aging. (1)(2)

These threads or sutures can be absorbable or non-absorbable. Non-absorbable threads are composed of polypropylene. Absorbable threads are made from slow-absorbing polymers compatible with the human body, including polydioxanone, polycaprolactone, and poly-lactic acid. Threads can also be classified as barbed or non-barbed. Currently, the most commonly used threads are absorbable and non-barbed.(3)(4)

The mechanism of action of these threads can be explained by histological changes, including a foreign body inflammatory reaction and stimulation of collagen production around the threads, typically observed around the fourth week after application. Microscopic wound formation has also been described, as stimulating neovascularization and fibroblastic activation, increasing collagen production, and causing adipocyte denaturation, thereby reducing subcutaneous thickness, and improving facial contour. (5)(6)(7)

Despite being considered a safe procedure with quick recovery and minimal scarring, it is not without the development of multiple complications, including erythema along the thread trajectory, visible threads, migration, exposure, and palpation of threads, nodule formation, hematomas, fistulas, abscesses, sunken cheeks, granulomas, vascular nerve bundle injury, and parotid capsule or duct injury; facial paralysis has even been reported. (1)(8)(9)(10)(11)

The diagnosis of some of these complications may be straightforward and performed through clinical inspection; however, a proper understanding of the complication type and the best way to resolve it can benefit from high-resolution ultrasound exploration.

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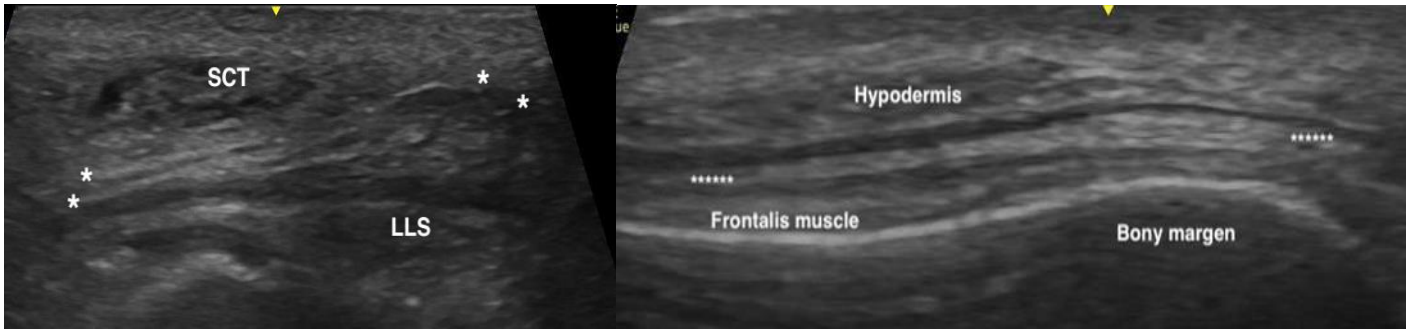
HOW DOES HIGH-RESOLUTION ULTRASOUND CONTRIBUTE TO THE ASSESSMENT OF COMPLICATIONS RELATED TO THREAD LIFT PROCEDURES?

High-resolution ultrasound has proven to be the best diagnostic imaging modality for evaluating complications observed in facial aesthetic procedures (12)(13)(14)(15)(16). The magnificent spatial resolution of this diagnostic modality allows for a precise definition and characterization of the different layers of the skin and its appendages (17)(18).

In patients with complications from thread lift, high-resolution ultrasound allows, among other capabilities, to determine the presence and level of thread degradation, visualization one or multiple threads, identification of the exact location plane of the thread, diagnosis of the type of complication (nodule, granuloma, fistula), assessment of the inflammatory activity of the complication, and identification of the anatomical structures adjacent to the complication. Additionally, in patients dissatisfied with the cosmetic outcome, it helps understand the best approach for removal.

The normal sonographic appearance of threads is that of a well-defined, hyperechoic linear structure with variable length, appearing as a single or multiple entity. See **Figure 1**.

Bruising and swelling are the most common complications observed, with an incidence ranging between 47-93% and 43-100% of patients, respectively (18). Generally, they do not require ultrasound evaluation for diagnosis or management. Acute hematomas present as irregular, hyperechoic collections with or without well-defined borders. Ultrasound allows visualization of the real extent of the hematoma and the involvement of deep tissue planes. See **Figures 2, 3**. Subacute or chronic hematomas are generally hypoechoic, and some may present a hematocrit effect, indicating hypoechoic fluid in the deepest portion of the hematoma with hyperechoic images above the liquid zone.



Figures 1A and 1B: Ultrasonographic normal appearance of threads, with asterisks (*) delineating the proximal and distal edges of the threads. They are observed as well-defined, hyperechoic linear bands that can be singular or multiple. In Figure 1A, they are situated in the deep subcutaneous tissue (SCT), superficial to the levator labii superioris (LLS) muscle. In Figure 1B, they are positioned above the frontalis muscle.

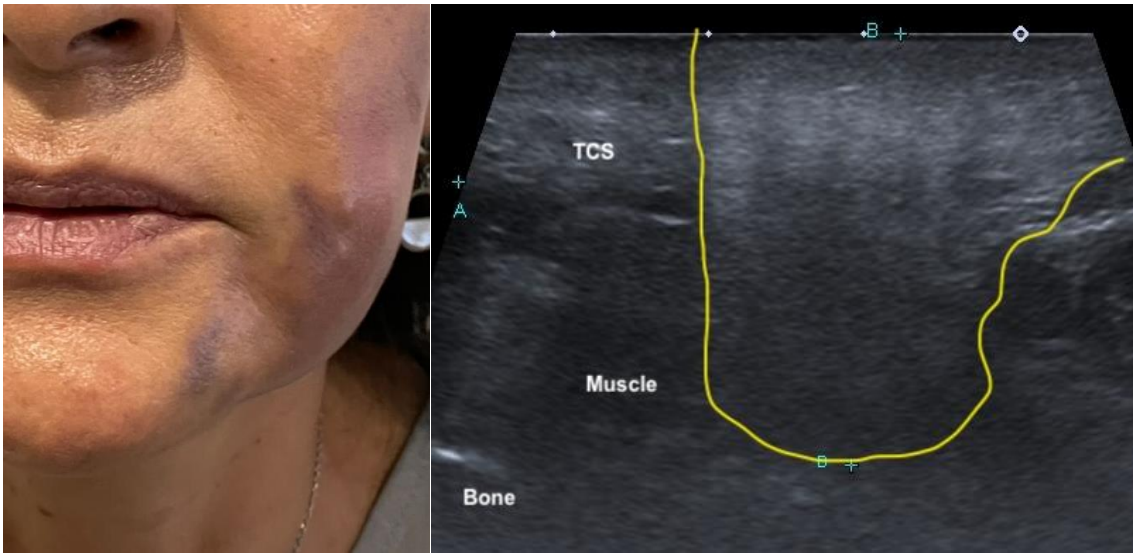


Figure 2A and 2B: Clinical image of a hematoma on the left mandibular border that appears the day after the insertion of threads. Figure 2B shows an acute, hyperechoic hematoma with irregular edges, delineated by the yellow line. The hematoma extends beyond the subcutaneous tissue (SCT) or reaches the edge of the masseter muscle

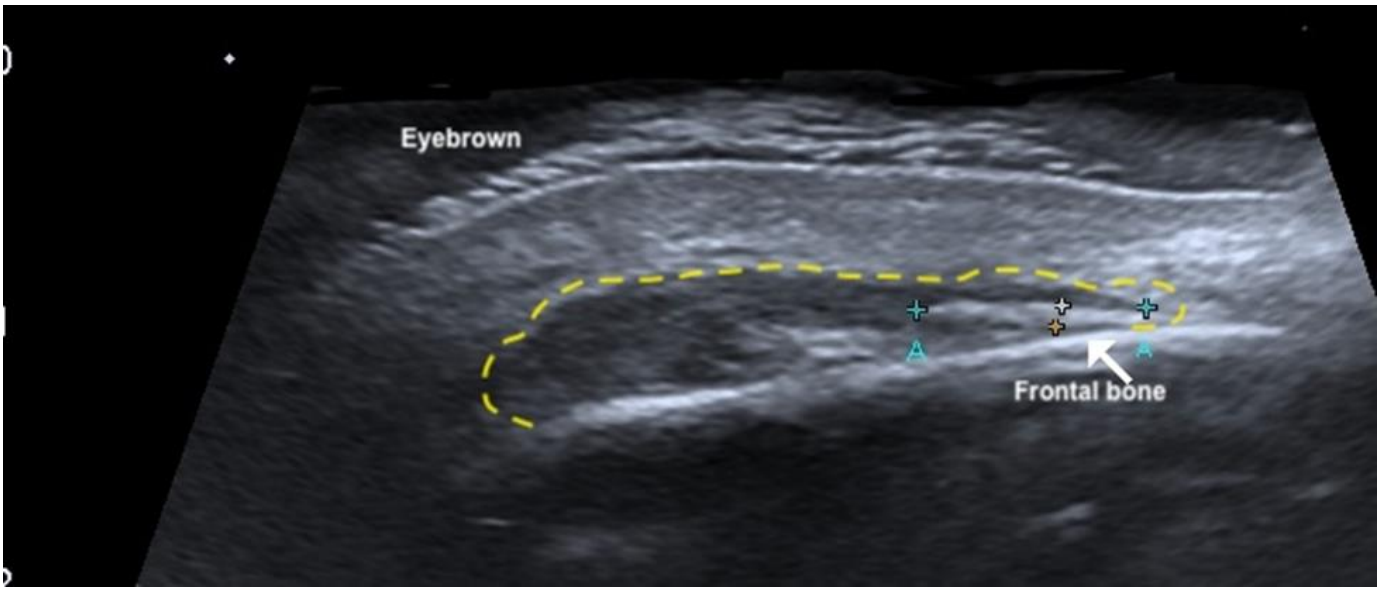


Figure 3: High-resolution ultrasound of the frontal region demonstrates, delimited by blue calipers (+A), a thread as a hyperechoic, linear band in the supra-periosteal region. A subacute evolving hematoma has developed at the periphery of the thread, visualized as a moderately hypoechoic collection bordered by discontinuous yellow lines.

Dimples are clinically recognized as a depression in the dermo-subdermal region, usually oval in shape. Their appearance is generally caused by errors in technique, such as superficial thread insertion or excessive traction (10)(19). Diagnosis is generally clinical and does not require ultrasound exploration. Visible threads appear as a visible and occasionally palpable linear band. Treatment involves thread removal (10). High-resolution ultrasound allows to visualize the exact location plane for proper removal and assessing whether there are any changes in the foreign body reaction. See **Figure 4**.

Nodules and indurations may appear secondary to the absence of thread degradation, the presence of edema in soft tissues surrounding the threads due to traumatic technique, or changes in foreign body reaction (8)(10). While their clinical presentations may be similar, high-resolution ultrasound allows for the identification of the cause of the nodule or induration appearance and the assessment of the level of inflammatory activity. See **Figure 5**.

A complication frequently observed in patients with non-degradable threads is sunken cheeks, clinically recognized as a linear depression observable along the cheek during facial expressions. Ultrasound typically reveals threads in the deep subdermal plane or fatty tissue bundles, with marked irregular hypo-echogenicity and moderate to severe posterior acoustic shadowing in the tissues surrounding the threads. Generally, Doppler examination shows no inflammatory activity. Dynamic ultrasound examination confirms the exact degree of tissue depression and retraction. See **Figure 6**.

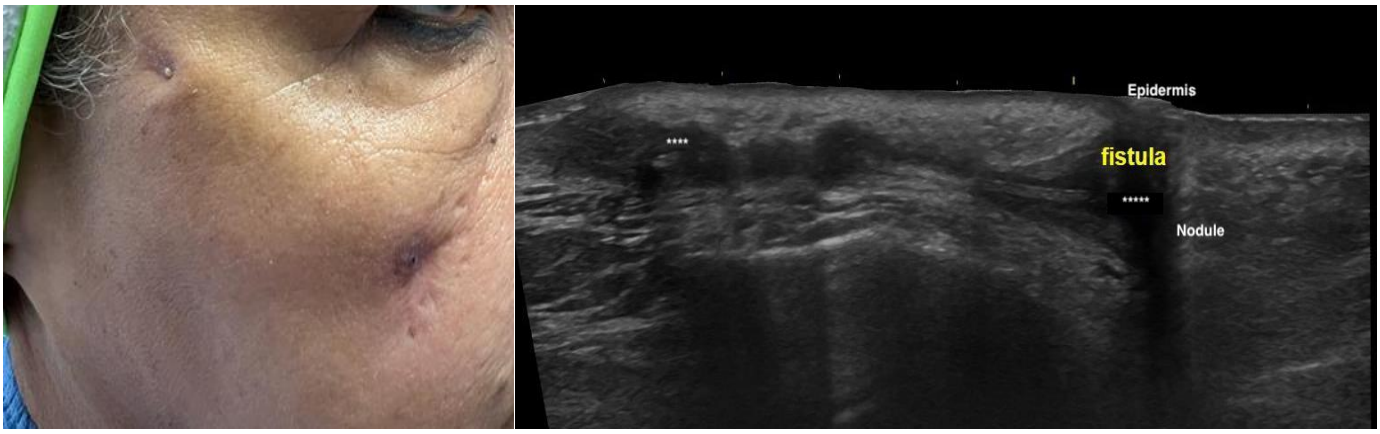
Figure 4A and 4B: Clinical image of visible and palpable threads indicated by yellow arrows. High-resolution ultrasound reveals the thread located in the subcutaneous tissue (SCT), with early foreign body reaction changes and posterior acoustic shadowing (asterisks ***)

Figure 5A and B: Clinical image shows the development of a nodule in the left zygomatic-malar region following the insertion of threads. High-resolution ultrasound demonstrates the bifilament-type thread as linear hyperechoic bands parallelly delimited by calipers (+). At the tip of the thread, an oval hypoechoic nodule with well-defined contours has developed due to early changes corresponding to a foreign body reaction.

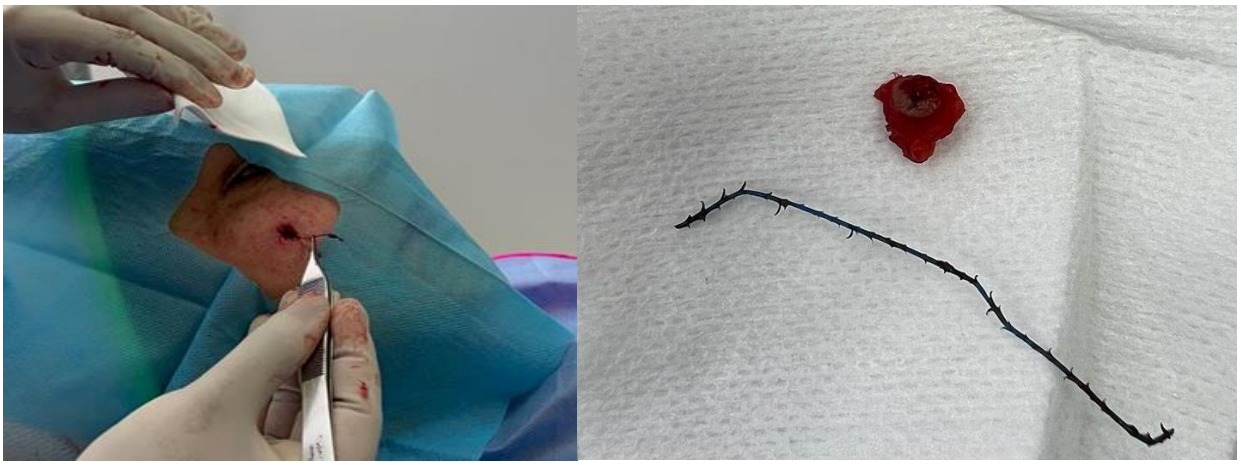
Figure 6A: Clinical image of a patient with a history of thread lift several years ago, currently presenting a linear depression in the cheek area with facial movements. Figure 6B. The asterisks (*****) show parallel hyperechoic linear bands corresponding to threads located in the deep plane of the cheek fat pad. The yellow arrows indicate areas of posterior acoustic shadowing corresponding to a foreign body reaction.

Fistulas are tubular structures located peripherally to the threads, which may contain clear fluid or develop changes corresponding to a foreign body reaction, a granuloma, and/or an abscess formation. On ultrasound, they appear as hypoechoic tubular bands delineating threads. Generally, the threads inside the fistulas remain intact without changes in degradation and are visible and identifiable. The fluid around the fistula may be hypoechoic or contain dense particulate echoes. Some degree of fibrosis in the fistula wall may develop, recognized as a hyperechoic band on the periphery. Doppler examination may show vascularization, usually intense due to marked inflammatory activity and the development of superinfection. Ultrasound precisely establishes the depth of the fistula, the degree of inflammation, the location plane, and the number of threads within. This information is relevant as thread removal is often used as the treatment (16). See **Figure 7**.

Finally, if threads continuously elicit a foreign body reaction, granulomas may appear (8)(20). On ultrasound, they are generally recognized as markedly hypoechoic nodules, usually with poorly defined irregular borders. Inside these nodules, the foreign body corresponds to the undegraded thread which is always visible as a linear hyperechoic band of variable length. Due to the fibrotic component of the granuloma wall, nodules often present some degree of posterior acoustic shadowing. Doppler examination commonly reveals significant vascularization in and around the nodule, indicating the inflammatory activity of the granulomatous process.



Figures 7A and B: Clinical images show areas of depression and retraction in the epidermis of the zygomatic malar region at the insertion site of the threads, with discharge corresponding of serohematic material. High-resolution grayscale ultrasound, longitudinal image, the asterisks (****) delineate the proximal and distal edges of non-degraded threads; on their periphery, a hypoechoic tubular structure corresponding to a fistula has developed, extending from the epidermis to the upper subcutaneous tissue.



Figures 7C and D: In the previous case, the treatment involved the removal of the thread, as depicted in the first image. Figure 7D shows the barbed-type thread, extracted without degradation, and the inflammatory nodule that is part of the fistula.

CONCLUSION

High-resolution ultrasound facilitates the accurate characterization of diverse complications that may arise from employing thread lift as a minimally invasive lifting procedure. The information gained from ultrasound, coupled with an understanding of facial anatomy, empowers the treating physician to manage these complications in a more precise and timely manner, leading to enhanced aesthetic outcomes.

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