Bio-Dynamic Tissue Stimulation using PDO Threads with New Approach of Combined Techniques: A Case Study

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Abstract

This article presents a biodynamic technique that stimulates tissue repair and regeneration using a 43 cm long PDO, Mint Lift threads ML 1043 (HansBiomed Corp.) and smooth PDO threads (monofilament Filbloc 5 cm - Assut Europe).

This is an affordable technique that allows 6 segments of threads to be used for tissue regeneration stimulation, reaching and delivering the main objective of the spiked support, where not only the insertion of bio-stimulants is done but the maintenance of the results is possible, given the physiological activity of the facial expressions and ageing.

This technique delivers as ideal as or enhanced result than the traditional one, since associating the threads can promote even better outcomes.

Keywords: PDO Threads; Mint Lift; Tissue Repair Triggers

Background

The search for cosmetic treatments that offer a delay on aging or any chance to achieve longer years into the youth gap of life have been pursued since the first millennium, however, the increase in life expectation that has happened with advances in medicine over the last two centuries have been giving people an extra component for the search of the youth formula, causing it to be even more complex to delivery minimized or delayed ageing effects with treatments. Historically, several techniques have been tested with the purpose of tissue suspension and support and creating spikes on sutures showed that the support potential for the threads have increased significantly [1,2]. The use of Polydioxanone threads (PDO), which maintain the tension of the tissue suspension for longer than any other polymer available in the market [3], brought the use of these techniques to a whole other level. However, the results are still associated to high levels of relapse of tissue to the original place, which can be explained by the fact that the spikes are the smallest parts of the threat and will reabsorb sooner than the remaining of the thread.

Besides, the insertion of the short, not fixed threads provides a more tonus-like effect than a facial lift. The results of the use for PDO threads in the face are directly related to the level of traction applied initially on insertion and, independently of the stable anchorage spot for this given purpose, it should be considered that the tissue adherence will only last the time necessary to induct the healing and neo-collagenase [4] - where the degradation of the tension forces that are consequent from then hydrolysis of the Polydioxanone is inversely proportional to the increase of the healing forces [5].

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Considering that the face presents several fat pads organized by fibrotic septa, which link the facial muscles to the facial skin [6] it seems reasonable to have the threads cross the compartmented areas, promoting biodynamical stimulation and orienting the neo-formation of new collagen. With this purpose, the authors bring here an adaptation of the traditional technique for the insertion of the PDO threads and propose a combination of the vectoral system for tissue stimulation, through the use of PDO medical suture thread with micro barbs alongside the use of a net of thin threads for support. This combination intents to promote an improved support of dimensional stability in conjunction with triggering a potential biological response, along the healing events that follow.

Methods

For this technique, we used the PDO thread MINT LIFT ML 1043 (HansBiomed Corp.) measuring. Each package brings two identical helicoidal bidirectional threads measuring 43 cm originally (Figure 1).

On a sterile field, the threads are opened and each of the 43 cm threads of the package will go through a sequence of 4 cuts (Figures 2 to 6) in order to obtain two unidirectional threads measuring 12 cm and one bi-directional thread measuring 12.5 cm.

Figure 3: Cut of the non-spiked tip.
Source: Authors.

Figure 4: Details of the smooth extremity, free of spikes, thread MINT Lift ML1043 measuring 43cm. The 2,5cm smooth tip is not used for this technique.
Source: Authors.

Figure 5: Thread cutting, average of 12cm each piece, in order to have two unidirectional parts.
Source: Authors.
Surgical markers

Beforehand, surgical access study must be conducted carefully, evaluating anatomical landmarks and biological limitations, and this is a per patient study. This will increase the success rate tremendously, and with this study you can simulate the threads placement by tensioning the patient’s skin with your fingers to plan the orientation of the skin movement. This increases confidence on the threads placing planning as the activity vectors are known.

Doctors intending to adopt this therapy for their patients have to acquire throughout knowledge on facial mimetic activity in order to use the facial activity on behalf of the treatment.

With the patient sitting on vertical position - keep in mind that the patient’s face should be interacting with gravity on a standing position as you plan this treatment, with cranium base parallel to Frankfurt - we used a flexible, disposable plastic ruler, to measure the markings.

At this time, it was used a regular makeup eye pencil - Chanel #61 Noir and marks were done in a way that two horizontal vectors were found around and out of malar eminence, still keeping the same insertion entrance point above the tragus area of the external ear, slightly within the hair line. Both vectors are divergent, and lower limit is a 0.5 cm anterior to the nasolabial folds. The vertical vector should have the insertion point at the height or slightly below the eyebrow tip end, with 2.5 to 3 cm above of the horizontal one, still in the sideburn area and within the hair line, and down along ending central to the facial fat pad layer, as shown on figure 7.

Anesthesia

Lidocaine 2% with epinephrine was used to the amount of 0.5cc to numb the entrance point. The entrance points are the beginning of a thin, straight path where the cannula carries the thread will travel through, along the determined lifting lines. To this technique, there’s no outlet for the threads inserted.

Cannula insertion path

With the help of a 18G, disposable hypodermic needle, a perforation is created in order to start the thread-carrier-cannula path. Mind that the angle of the cannula will determine the path, so the entrance perforation is created with the needle in a parallel position to the skin, as shown in figure 8. For that, a fold can be forced in the skin with the surgeon’s finger, as shown on figure 9, to facilitate the perpendicular angle for the needle bezel and also to control its depth of insertion. With this, the surgeon can control the amount of tissue brought
against the needle’s bezel. A larger than needed fold may result in an excessive final fold left which may steer the cannula’s path and it may compromise the full placement of the thread, outside the planned path. It is important to be mindful of the initial angle and vectors of placement as to serve for reference of the cannula path before starting.
Once the perforation for the path is created, the first set of cannula/mandrel can be inserted (cannula 1.5 mm X 15 cm bezel thread slider) juts by raising the skin slightly with the fingers. The vertical vector should be the first one for this technique. The vertical cannula, after inserted, will serve as a guide for the next ones, so it should be maintained in position until the completion of the insertion of the unidirectional threads for the horizontal vectors. This is done with the objective of preventing the dislodgement or even the rupture of the PDO threads where the cannulas cross, in the subdermal level. After that, the procedure will be repeated for the second set of cannula/mandrel (cannula is 1.5 mm X 14 cm round bezel with thread slider) on the second horizontal vector.

**Figure 10:** The horizontal cannula must be inserted after the correct positioning of the vertical cannula.
*Source: Authors.*
The mandrel has the purpose to avoid the cannula of getting clogged during the subdermal insertion, and after placed, the mandrel can be safely removed to give place to the first segment of unidirectional thread to be inserted into the cannula with the help of a Adams plier or Hemostatic plier.

As the thread is inserted, all of the thread micro barbs present on the unidirectional segment of thread should be facing the entrance point. Once the thread length is the same of the cannula, the mandrel is slightly reinserted into the cannula's entrance again, in order to push the thread tip out of the cannula’s end, where the thread will contact the subdermal level. This can be observed directly as the skin changes slightly in volume, in the area where the surgeon is working.

**Figure 11:** Subcutaneous crossing between cannulas, and removal of internal mandrel from cannula.

*Source: Author.*

**Figure 12:** Insertion of the unidirectional PDO thread segment inside the cannula with the help of a plier.

*Source: Authors.*

This step will be repeated once more, alternating the cannulas removal with the help of slight digital touches. As the threads reach direct contact with the subdermal level, the first thread micro barb will fix the thread tips, which will avoid the threads to move while the cannulas are being removed.

![Figure 13](image13.png)

**Figure 13:** Unidirectional segment of thread as it was just inserted into the subdermal layer.  
*Source: Authors.*

A slight elevation of the first thread in place allows us to proceed with the insertion of the cannula/mandrel set for the next thread positioning, following the other horizontal drawing as marked on the skin, as shown below, on figure 14. The same entrance orifice - created with the needle before - will be used for the insertion of the cannula/mandrel set again, and all steps from the first insertion will be repeated for the second horizontal threads.

![Figure 14](image14.png)

**Figure 14:** Elevation of the unidirectional thread, with the help of a plier, to create an entrance point for the cannula/mandrel set.  
*Source: Authors.*
Figure 15: Insertion of the second unidirectional thread, following the other horizontal marking, repeating the same steps from the one inserted before.

Source: Authors

With both unidirectional segments of thread in place, following the horizontal vectors as planned, and as shown on figure 16, the insertion of the last thread can now follow, with the placement of the cannula/mandrel set for the placement of the bidirectional segment remaining.

Figure 16: Surface aspect of the skin, with both unidirectional segments of thread in place, using one only entrance point.

Source: Authors.

As the mandrel is removed from the vertical cannula, which will still be in position on the subdermal space, we’ll use the cannula as a guide for the insertion for the bidirectional thread - the central piece of the PDO thread - as show on figure 17. All procedures described so far for the horizontal vectors should be followed as well, and the repositioning of the mandrel is also necessary, once this segment of thread is slightly shorter.

After the complete positioning of threads - both horizontal unidirectional segments and the vertical, bidirectional segment - a slight traction will be performed on all 3 segment tips, as shown on figure 18.

After the tonus of the skin is triggered by the threads slight pull, a curve needle - which comes as part of the MINT LIFT thread set - was used to anchor the tip of the bidirectional thread into the temporal-parietal periosteum, as shown on figure 19. To create the anchoring

effect of this thread tip, the needle will lead the thread tip under the periosteal layer, towards the bone, and this needle will create a new outlet point, more superior and stable, which will increase the mechanical tensioning results to the adjacent skin.

![Figure 19: Anchoring of the thread tip under the periosteal layer in the temporal parietal scalp. Source: Authors.](image)

After the needle leads the thread tip to the periosteal under layer, the tip of thread left should be cut and disposed, as shown on figure 20. The scissor will pressure the skin down while the plier pulls the thread tip slightly, in order to cut enough thread so the subdermal thread tip will submerge under the skin.

![Figure 20: Cutting of the leftover tip of the bidirectional thread, with a curve Iris scissor. Source: Authors.](image)

With the same purpose, both segments of the unidirectional horizontal threads will be tied between each other, with two simple knots, one tied clockwise and the next against the clock. This will improve the stability and prevent the threads from sliding down, as shown on figure 21. The surgeon should keep in mind that a small knot should be left and accommodated within the orifice used for the insertions, and within the hair line.

In order to maximize the dimensional stability and to improve the biodynamical tissue stimulation, a network of smooth threads will be inserted (PDO Monofilament Fibloc 5 cm - Assut Europe) in a more superficial layer, into the subcutaneous cellular plan of the facial skin. This second step of the shown technique has the objective to create intersections between the threads, as this will give the skin a structural frame. The more flaccid the skin area, the better the result, as long as the threads are positioned in a scaffolding design. This technique allows distinct areas of the skin to work together, creating an integrated tridimensional structure, united by the fibrotic superficial SMAS [6].
In order to directly observe and prove the interaction between the threads used for the technique we preconize here; a surgical dissection was performed after the placement of the threads in a fresh frozen cadaveric specimen (MARC institute - Miami - FL - US). For this experiment, the facial skin was carefully removed from the surface where the threads are supposed to cross and display as a scaffolding network. In addition, the layers where the different threads were to be placed could also be exposed and observed.

**Figure 23:** Fresh frozen cadaveric specimen (MARC Institute - Miami - FL - US) and the observational window of skin being dissected in order to expose the threads placement and relationship between each other.

*Source: Authors.*

On the anatomical specimen shown, after the removal of the superficial layers of the epidermis, it can be directly observed where the unidirectional threads were placed, and the bidirectional vertical thread related to the SMAS [6] as shown in figure 24.

**Figure 24:** Anatomical fresh frozen cadaveric specimen (MARC Institute - Miami - FL - US) and evidence of the placement of all 3 segments of micro barb threads.

*Source: Authors.*

When placed, the smooth threads can be seen in position and its network formation along the micro barb threads.

Once the guiding needles are removed, the scenario exposed with the dissected observational window will reveal the positioning of all PDO threads in place, as shown on figure 26.
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Discussion

The technique here described and explained by the authors allows only one package of the thread MINT Lift 43 cm to originate 6 individual vectors used for facial tissue stimulation, which provides an affordable option with great clinical results.

Considering the thickness as one of the primary factors responsible for the biomechanical features of the dermal layer of the skin, other than the skin tonus, moisture, quality of skin and also the collagen and elastin [1] vector of fibers, the objective of using the spiked threads in not only to apply new tension to the skin, but also to maintain it for a reasonable time [7] and the use of a convergent, bidirectional system, with the micro barbs being disposed in opposite directions, allows the micro barbs to act causing some mechanical bracing of the skin and, the subsequent direction allows the stability of the thread.

On the other hand, the “U” shaped disposition of the threads, which are initially only unidirectional, will create two forces, one against the other, which will be physically distributed along the whole length of the threads.

This disposition of the threads promotes effectiveness and a time frame of treatment compatible to the time frame necessary to the body to produce and mature new collagen, creating like this a more robust, thick collagen organized along the new lines of tension [4].

It is clear by now with the information provided here in this article, along the explanation of the surgical access necessary to do it, that manipulating small parts of the threads require the Doctor to be properly trained but, the peculiar stabilization of the bidirectional thread parts towards the scalp and not originating from it, minimizes the post-operatory risks and complications significantly, like the often seen abscesses formed at the insertion point of entrance for the thread, originally preconized by thread lifting techniques [8].

Figure 27: Fresh frozen cadaveric specimen with dissected epidermal skin for observational window and the displaying of threads in a scaffolding network setup, after the removal of the cannulas and needles.

Source: Authors.
Conclusion

The surgical technique proposed here by the authors allows an alternative for the placement of PDO threads - using two MINT Lift threads with 43cm in length each, alongside smooth small threads - is a safe and efficient technique and provides patients with an affordable option for facial thread lifting.

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Bibliography


