

Case Report: Histological findings after insertion of PLLA sutures with bi-directional cones in human: Two years follow-up



PAOLA ROSALBA RUSSO

• Paola Rosalba Russo¹ • Franco Vercesi² • Luca Migliorini³ • Marie-Odile Christen⁴

SUMMARY

Authors present their study about histology after insertion of bidirectional cones sutures in two volunteers with biopsies taken after 3, 6, 12 and 24 months. The sections (4-micron thickness) were stained with standard hematoxylin-eosin (HE) and Picrosirius Red (Picro Sirius Red Stain Kit - ABCAM ab1506819) to study collagen around the threads.

Results show the production of a shell of collagen mainly type 1 around the threads and this shell is still present after 2 years, doubling the diameter of the 3-0 thread.

No adverse reactions have been observed.

KEYWORDS

Poly-lactic acid threads, suspension threads, opponment cones threads, collagen stimulation

¹ General Surgeon, Modena, Italy

² Plastic Surgeon, Milan, Italy

³ Pathologist, Magenta Hospital, Italy

⁴ Marie-Odile Behavior, Paris, France

INTRODUCTION

During the last years the number of treatments in the field of aesthetic medicine increased a lot in terms of number of patients treated and treatment variety.

One of the most growing treatment modality has been sutures insertion under the skin to obtain a tegumental lifting and repositioning and to stimulate collagen production for a better anti-ageing effect [1]. This putative stimulating effect of sutures has been poorly documented in the scientific literature, most of all in human. Authors have a great clinical experience with the polyLactic acid bidirectional cones sutures that are believed to be the most suitable for skin retightening via immediate face and neck soft tissues repositioning and gradual tissue regeneration. Indeed, In their experience they observed not only an immediate effect of support and soft lifting of the skin but also a real improvement of the results after a few months of insertion with an evident increase of skin quality. This was the reason for the authors to search any evidence of mechanism of action on a biological basis.

Materials and Methods

Two volunteers received one couple of bidirectional cones sutures implanted under the skin of their flanks; surgical biopsies had been taken at different times for two years. (Figure 1).

The subjects were one man 49 yo and one woman 58 yo both in absence of pathologies and therapies.

The sutures inserted of a size 3-0 (0.3mm diameter) are made of 100% of poly-lactic acid for the monofilament while the cones are made of a poly-lactic acid (82%) and glycolic acid (18%) copolymer (Figure 2). The sutures were 8 cones and totally resorbable (Silhouette Soft, Sinclair Pharmaceuticals, London, UK).

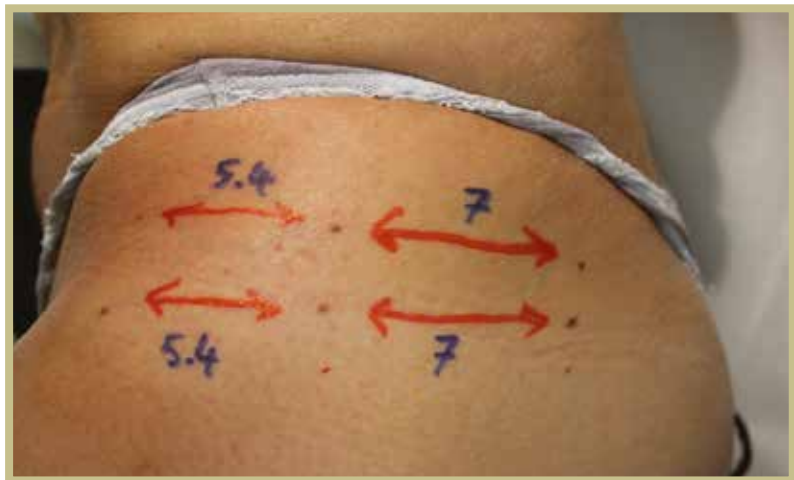
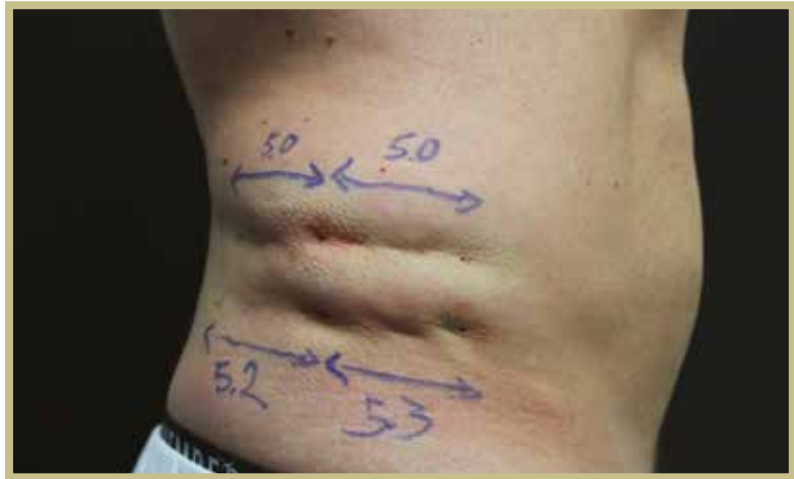


Figure 1.
Polylactic acid sutures
inserted under the skin of
two volunteers flanks.

Figure 2.
8 cones suture.



Figure 3.

After 3 months. 10X
Light microscopy with HE, a fibrotic reaction all around the suture with giant multinucleated cells inside the fibers.

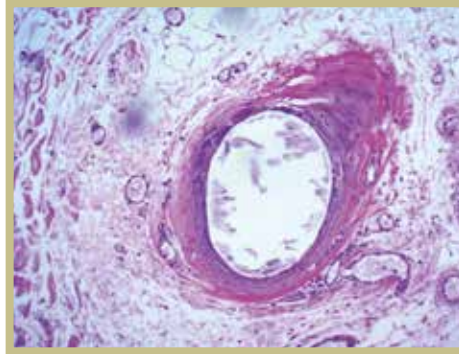


Figure 4.

After 3 months. 10X
With Picrosirius staining the tissue stained in red color allowing to consider this fibrous tissue to be collagen.



Figure 5.

After 3 months. 10X
Under polarized light microscopy with picrosirius staining we observed the presence of collagen type- I (orange) and type- III (greenish) with a slight prevalence of the second one.

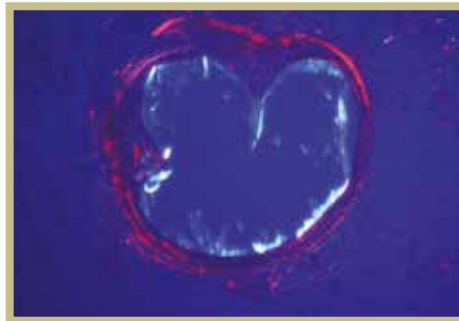
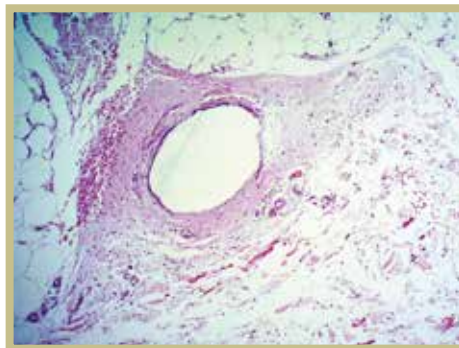


Figure 6.

After 6 months. 10X
Light microscopy with HE staining: giant cells were no more present and the tissue around the suture was thicker with well organized fibers.



To identify the area of sutures insertion the entry and exit points have been temporary tattooed.

Excisional biopsies have been taken after 3 months, 6 months, 12 months and after 24 months.

All the biopsies have been fixed in 10% neutral buffered formalin (max 48 h) and paraffin- embedded. No part of the material has been frozen.

The sections (4-micron thickness) were stained with standard hematoxylin-eosin (HE) and Picrosirius Red (Picro Sirius Red Stain Kit - ABCAM ab1506819).

Specific staining by Picrosirius red is one of the most used stains to study collagen networks in different tissues including the skin, that appears red using light microscopy. Using polarized light microscopy one can distinguish the type-I collagen that stains in yellow/orange and the type-III collagen that stains greenish.

Results

After 3 months

Under light microscopy with HE, a fibrotic reaction all around the suture with giant multinucleated cells inside the fibers as for a foreign body reaction, has been observed (**Figure 3**). With picrosirius staining the tissue stained in red color allowing to consider this fibrous tissue to be collagen (**Figure 4**). Under polarized light microscopy with picrosirius staining the presence of collagen type- I (orange) and type- III (greenish) but with a slight prevalence of the second one, has been visualized (**Figure 5**).

After 6 months

Under light microscopy with HE staining giant cells were no more present and the tissue around the suture was thicker with well organized fibers (**Figure 6**). With picrosirius staining it has been possible to confirm the presence of a well organized shell of collagen around the suture

(Figure 7). Under polarized light microscopy with picrosirius staining the presence of collagen type-I much increased reaching almost 90% of the observed collagen (Figure 8).

After 12 months

Under light microscopy with HE staining the tissue around the suture was thicker and better organized reaching a dimension of 0.3 mm that means a doubling of suture diameter (Figure 9). With picrosirius staining it has been possible to confirm the presence of a well organized shell of collagen around the suture (Figure 10). Under polarized light microscopy with picrosirius staining the presence of collagen type-I is still the predominant type present (Figure 11).

After 24 months

Under light microscopy with HE staining we observed signs of suture absorption, the tissue around the suture had still the same thickness, well organized maintaining the dimension of 0.3 mm thickness (Figure 12). With picrosirius staining the signs of suture absorption and the presence of collagen around the suture were confirmed (Figure 13). Under polarized light microscopy with picrosirius staining the presence of predominant collagen Type-I has been observed (Figure 14).

Discussion and Conclusions

The first observation which can be drawn from this study is about safety: no adverse reaction has been noticed around the PLLA sutures implanted in human.

The histological examination has shown that the PLLA sutures induce a net collagen production stimulated by the presence of the suture itself; at the beginning there is evidence of foreign body reaction with the presence of multinucleated giant cells and a predominance of Type III collagen, which was expected in response to the trauma linked to the implantation; soon after, at 6 months these signs disappear and the col-

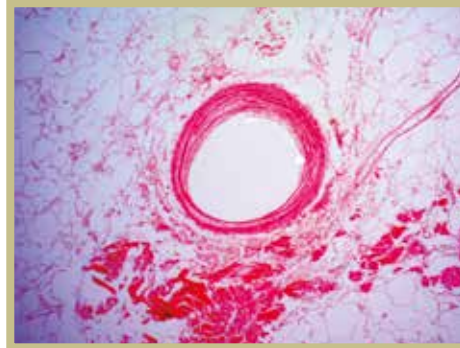


Figure 7.

After 6 months. 10X
Picrosirius staining: presence of a well organized shell of collagen around the suture.

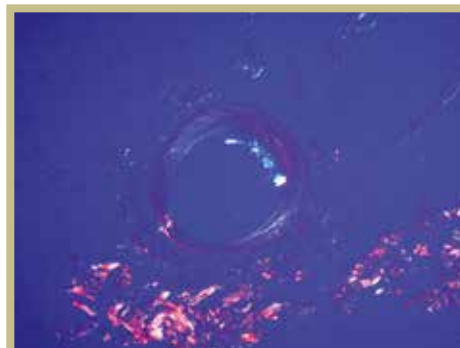


Figure 8.

After 6 months. 10X
Polarized light microscopy with picrosirius staining: collagen type-I increased reaching almost 90% of the observed collagen.

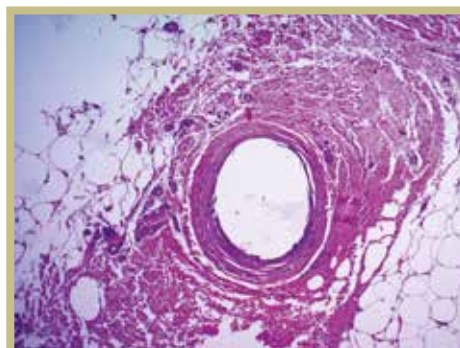


Figure 9.

After 12 months. 10X
Light microscopy with HE staining: the tissue around the suture is thicker and better organized reaching a dimension of 0.3mm that means a doubling of suture diameter.

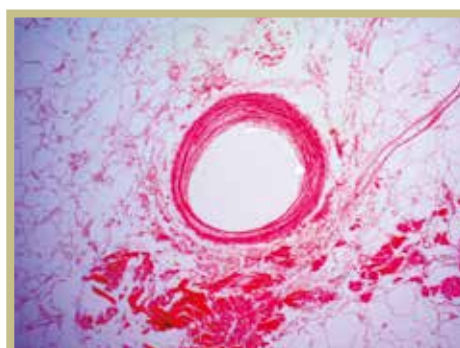


Figure 10.

After 12 months. 10X
Picrosirius staining: confirm the presence of a well organized shell of collagen around the suture.

Figure 11.

After 12 months. 10X
Polarized light microscopy with picrosirius staining: collagen type I is still the predominant type present.

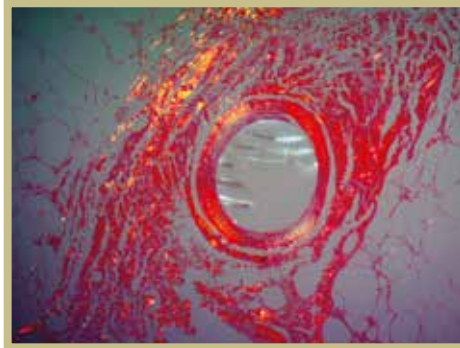


Figure 12.

After 24 months. 10X
Light microscopy with HE staining: signs of suture absorption, the tissue around the suture had still the same thickness, well organized maintaining the dimension of 0.3mm thickness.

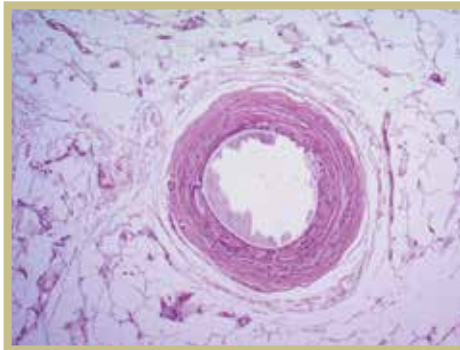


Figure 13.

After 24 months. 10X
Picrosirius staining: the signs of suture absorption and the presence of collagen around the suture are confirmed.

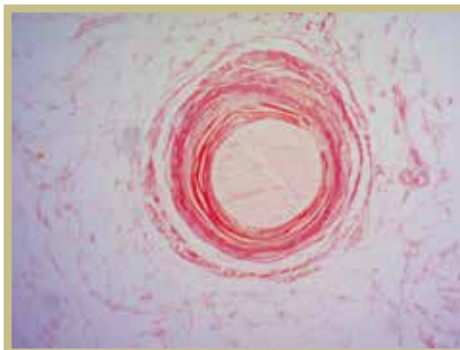
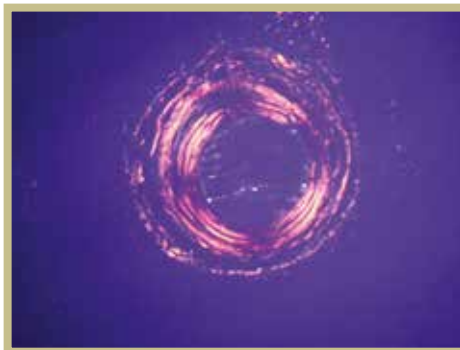


Figure 14.

After 24 months. 10X
Polarized light microscopy with picrosirius staining: collagen Type-I is still the predominant one.



lagen produced is mostly of type-I. After 12 months, the collagen shell around the suture doubles the diameter of the suture itself and this observation is still maintained after 24 months when the suture starts degradation.

The predominance of type-I collagen around the suture is a very interesting finding as it evidences the mechanism of action that is not a simple inflammatory response to the presence of a foreign body but is a real and well structured biostimulation. It was observed that the collagen formation occurs in a direction that is the one of the vector of traction of the inserted sutures.

The study results confirm the preliminary observations on similar sutures [2-3].

To conclude we can state that PPLA bi-directional cones sutures exert their skin retightening effect not only by a mechanical action to support the skin but also via a biological action at the cellular level through collagen type- I stimulation around the suture, in human lasting for 2 years.

REFERENCES

1. Nestor MS, Ablon G, Andriessen A, Few J, Gold MH, Goldberg DJ, Lorenc P, Mandy S, Weinkle SH. Expert Consensus on Absorbable Advanced Suspension Technology for Facial Tissue Repositioning and Volume Enhancement. *J Drugs Dermatol.* 2017;16(7):661-666
2. Gamboa GM, Vasconz Lo. Suspension technique for midface and neck rejuvenation. *Annals of Plastic Surgery.* 2009; 62: 478-481
3. Consiglio F, Pizzamiglio R, Parodi PC, De Biasio F, Machin PM, Di Loreto C, Gamboa M., Suture with resorbable cones: Histology and physico-mechanical features. *Aesthetic Surgery Journal* 2016; 36(3): NP122–NP127