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# The use of intraoperative fascial traction in W3-incisional hernia repair: A revolution or an emergency exit (two case reports)

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## Abstract

In the modern era of tension-free hernia repairs, any tissue tension seems to be counterproductive. It was believed to cause tissue damage, hemorrhage, and chronic pain, and lead to higher early or late recurrence rates. Surprisingly, recently published data on intraoperative fascial traction do not confirm this harmful effect of tissue tension in the cases of sufficiently wide mesh augmentation. On the contrary, the traction was reported to be beneficial in order to approximate large hernia defects and at the same time avoid the wide tissue preparation of component separation (CS) techniques. Below is presented our initial and positive experience regarding this after intraoperative fascial traction was used in two patients, each of them with a large incisional hernia (W3). Without intraoperative traction, the linea alba could not have been approximated in patient 1 without CS, and a large bridging of the linea alba would have been necessary in patient 2. The duration of hospitalization in both patients was short and there were no negative long-term results. It seems that intraoperative fascial traction facilitates the closure of hernia defects. It can serve as a useful adjunct tool in the surgery of large midline incisional hernias (W3) in the future. However, more data are needed to better evaluate this method.

## Keywords:

Component separation, intraoperative fascial traction, linea alba, midline incisional hernia

## Introduction

Despite rapid progress in hernia surgery and a great variety of mesh materials available, the management of large W3 incisional hernias (>10 cm in diameter) is still a challenge.<sup>[1-3]</sup> The repair of these hernias is more difficult in obese patients, in defects of the upper abdomen, and in re-do procedures.<sup>[4]</sup> Once the defect is narrower than 4 cm (W1), the need for a component separation (CS) is rare. In W2 patients (hernia defects of 4–10 cm) this depends on the patient's weight and factors listed

above. The decision to use CS can mostly be predicted, yet occasionally it is made intraoperatively after the closure of the posterior layer of the hernia defect.<sup>[4,5]</sup> No CS technique (anterior or posterior) should be seen as a simple procedure or just as a normal extension of the operation.<sup>[5,6]</sup> All CS procedures should be regarded as major operations and can lead to complications, most commonly hematomas and infections, but sometimes also chronic pain.<sup>[2,5]</sup> Tissue tension in any hernia repair, especially in incisional hernias, has not been just unwanted, but also contraindicated up

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to now.<sup>[7,8]</sup> It has been reported that any reduction in tissue tension can contribute to an improved short- and long-term surgical outcome and reduce surgical complications.<sup>[9]</sup> According to the literature, any tension of the approximated edges of the hernia defect should not exceed 35N to achieve good results.<sup>[10]</sup> It has also long been known from inguinal hernia repairs that tension-free techniques have the advantage over tissue repairs, especially in large hernias.<sup>[11]</sup>

However, a tension-based technique for tissue/fascial elongation in hernia repair has recently been described in the literature.<sup>[12]</sup> Even long-term results have been reported as unexpectedly successful.<sup>[13]</sup> The technique involves the implementation of intraoperative fascial traction (IFT), which reaches 120–140N of force over 30 min intraoperatively and results in the approximation of displaced fascial edges of the hernia defect. The literature shows IFT to have best results in midline defects, although transverse defects are not an absolute contraindication for its use.<sup>[12,13]</sup> The complete approximation of the linea alba in defects over 10 cm has also been described.<sup>[12,13]</sup>

In order to assess the efficiency of IFT, we implemented it in hernia repairs of two patients with W3-incisional hernias.

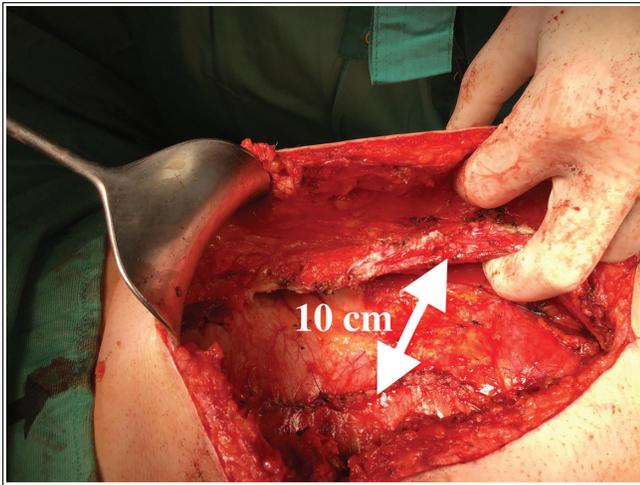
### Case presentation 1

A 59-year-old male patient with a body mass index (BMI) of 26 and 1 year after rectosigmoid resection due to adenocarcinoma was diagnosed with a W3 incisional hernia of 20 cm (L) × 15 cm (W) in diameter in the mid abdomen (M2, M3, M4) [Figure 1(A)]. Considering the high physical activity level of the patient in his everyday life, the hernia limited his quality of life. A loss of domain (LOD) index of 17%, according to Tanaka, was calculated.<sup>[14]</sup> Preoperatively, a cumulative 300 units (I.E.) of botulinum toxin A (BTA) were applied bilaterally at three preselected and marked spots on each side under sonographic guidance according to Zendejas *et al.*<sup>[15]</sup>

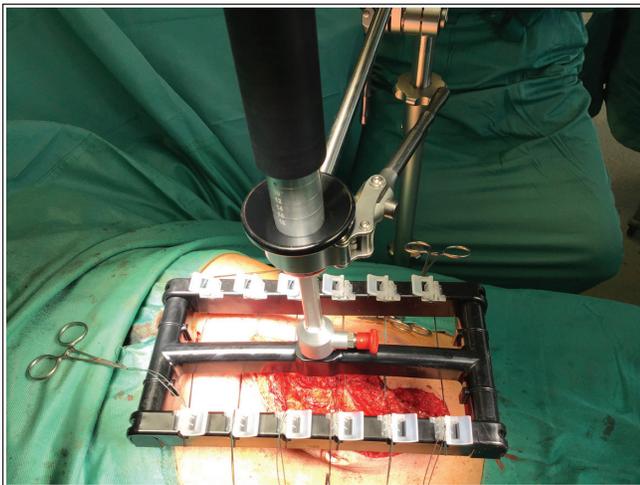
Intraoperatively, a complete excision of the hernia sac and a tension-free approximation of the posterior rectus sheath were performed. A 10 cm gap between the anterior rectus sheath edges was overcome using IFT—a 30-min traction of 12–14 kg on both anterior rectus sheath edges (subxyphoidally in a minimally-invasive way). This resulted in the complete approximation of both sides [Figures 2–4]. A 30 cm × 20 cm self-adhesive polypropylene mesh was then inserted. The linea alba was sutured in a small-bite with long-term resorbable monofilament suture. The total operation time was 2.5 h. The patient was observed for 24 h postoperatively



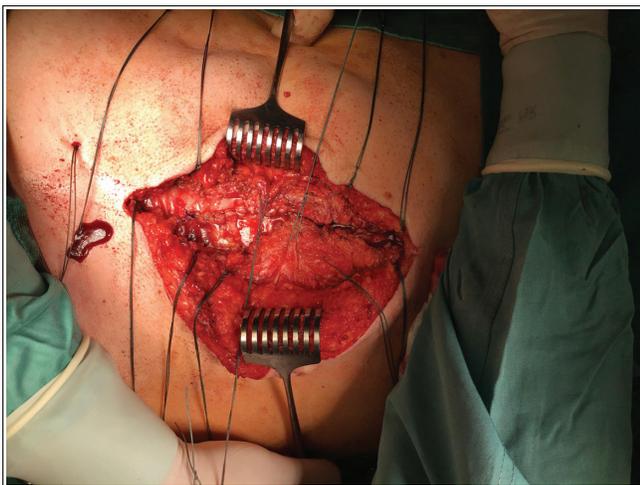
Figure 1: (A) and (B): Patient 1 pre- and postoperatively



**Figures 2:** After abdominal closure (sutured peritoneum and posterior rectus sheath) a 10 cm wide gap of the linea alba would be impossible to approximate without traction



**Figures 3:** 30-minutes traction enabled full approximation of the linea alba



**Figures 4:** IFT sutures can be - in order to avoid extensive skin incisions - inserted transcutaneously (left part of the figure)

in the intensive care unit (ICU), and his intraabdominal pressure (IAP) was normal. The patient was discharged from the hospital on the 5<sup>th</sup> postoperative day. The skin staples were removed 2 weeks after the operation [Figure 1B].

### Case presentation 2

A 63-year-old male patient with a BMI of 29 and 2 years after sigmoid resection due to diverticulitis 2 years before hernia repair. Acute sigmoid resection with several postoperative complications (ileostomy, ostomy reversal, small bowel perforation, and open abdomen (laparostomy), and intraabdominal VAC-therapy for several weeks). The incisional hernia measured 25 cm (L) × 20 cm (W) between xyphoid and symphysis [Figure 5(A)]. According to the computer tomography scan, the LOD was estimated at 25%. 300 I.E. of BTA were applied bilaterally 1-month preoperatively according to Zendejas *et al.*<sup>[15]</sup>

Intraoperatively, a complete scar excision was performed along the whole length of 30 cm. Sublay and bilateral transversus abdominis release with nerve preservation bilaterally and a self-adhesive polypropylene 40 cm × 40 cm mesh was inserted before fascial traction. After 30 min of IFT with 12–14 kg (with short periods of 20 kg), a subcomplete restoration of linea alba was achieved [Figures 6–9]. An area of 10 cm (L) × 2 cm (W) of exposed mesh was covered by an adhesive sponge-sealing material. The total operation time was 4.5 h. The patient was observed in the ICU for 24 h postoperatively, IAP was within normal range. He was dismissed from the hospital on the 6<sup>th</sup> postoperative day. The postoperative period was smooth, the skin clips were removed 2 weeks postoperatively [Figure 5(B)].

### Discussion

The management of large incisional hernias started with the onlay mesh technique in 1950 and was extended with anterior CS, first described by Albanese and later developed by Ramirez.<sup>[16]</sup> After Rives and Stoppa introduced sublay repair in 1985, it was evident that the technique would be an important tool in the future.<sup>[17]</sup> Milburn and Carbonell introduced posterior CS into daily practice<sup>[18]</sup> in 2007 and 2008, respectively. Novitsky *et al.*<sup>[19]</sup> reported improved TAR with nerve preservation in 2012.

TAR is a demanding and highly skilled operation that has possible complications, such as hematomas and wound infection, sometimes also chronic pain.<sup>[5,6]</sup> It should only be performed in certified hernia centers that have data registries and a sufficient case load. Preconditioning with BTA should always be discussed and/or implemented as a possibility to facilitate



Figure 5: (A) and (B) Patient 2 pre- and postoperatively

defect approximation.<sup>[15]</sup> Good communication and coordination between different specialists (radiologist, surgeon, anesthesiologist, ICU staff, physiotherapist) are a must.<sup>[5,6]</sup>

The first idea of tissue traction was conceived by Eucker in 2017.<sup>[12,13]</sup> In 2021, Niebuhr *et al.*<sup>[12,13]</sup> published a report about his experience in IFT in large (W2, W3) hernia defects. The first reactions among experts were reserved. This is not unreasonable in the era of tension-free hernia repair that started decades ago and brought good results.<sup>[7,8]</sup> It was thought that any tissue tension following traction could lead to early and late recurrences and/or other complications.<sup>[10]</sup>

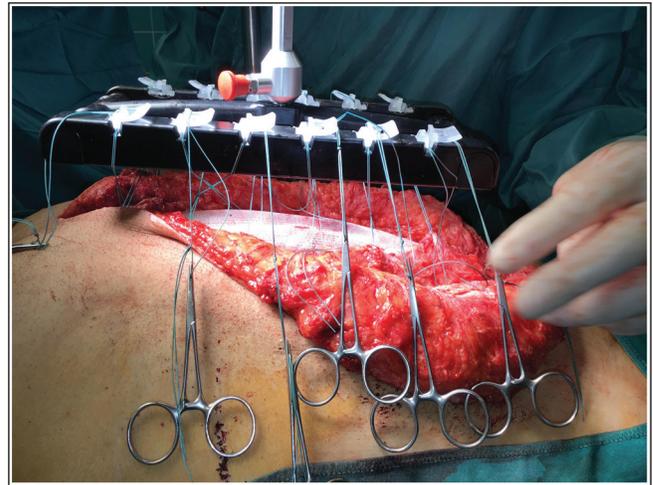
Surprisingly, the data published on IFT did not show any expected major disadvantages.<sup>[12,13]</sup> On

the contrary, IFT could replace one- or two-sided TAR in large transverse defects in midline incisional hernias and avoid extended tissue preparation.<sup>[12,13]</sup> However, its value in non-median hernia defects is questionable.<sup>[12]</sup>

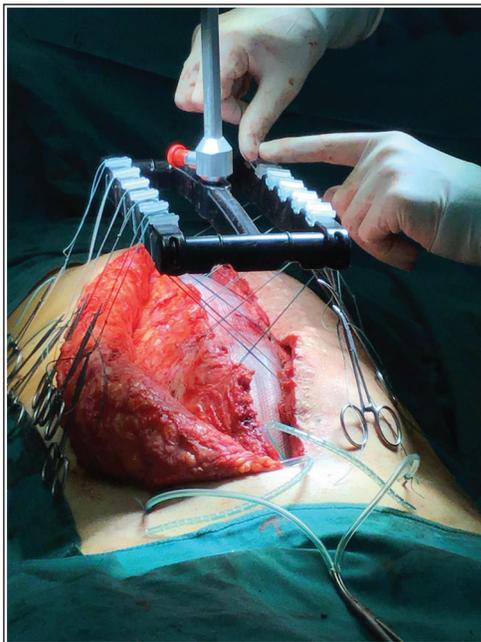
Our own decision to implement IFT was made after a good experience with surgery in big incisional hernias, including CS.<sup>[20]</sup> Neither of our two patients had any complaints postoperatively. Objectively, the postoperative development was smooth. The IAP measured routinely in the first 24 h through the urinary catheter was normal in both patients. In patient 1, the mesh was inserted after the fascial traction. In patient 2, the mesh was inserted before the fascial traction. This seemed to be a better decision as the approximation of the linea alba may be more complete



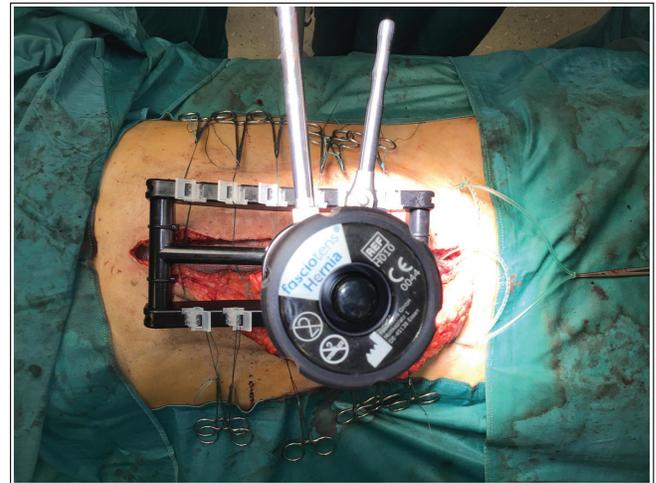
**Figures 6:** After abdominal closure, a 40 cm x 40 cm self gripping mesh was inserted prior to traction to linea alba (gap of ca. 20 cm)



**Figures 8:** Readjusting of the pulling strings during traction is easily performed with the IFT device



**Figures 7:** After 30 minutes traction, only an anterior bridging of 10 cm x 2 cm was necessary



**Figures 9:** A traction of 12-14 kg is sufficient to approximate most of the defects

immediately after the accomplished IFT, without any delay. Additionally, polypropylene mesh *in situ* does not seem to be a disadvantage for traction during IFT. In patient 1, the size of the defect indicated unilateral or bilateral CS (TAR). With the use of IFT, CS could have been completely omitted. In patient 2, large bridging (mesh exposure in the subcutaneous tissue) would be necessary without IFT. The final bridging gap of 2cm could be regarded as minimal compared to the large initial defect. It should not represent a potential cause of possible late recurrence, mainly due to the wide lateral mesh overlap. In our view, M1/M2

defects (upper abdomen) could profit more from IFT in comparison with M4/M5 defects, as the rib cage can limit approximation of fascial structures. The fascial structures of the lower abdomen may respond to IFT more effectively.

None of our patients were obese. Patient 1 had a normal BMI and patient 2 was only overweight. It is known that open surgery and obesity are independent risk factors for complications such as hematoma and surgical site infections (SSI), compared to minimally invasive techniques and patients with normal BMI. It is also known that obesity in these patients is linked to a higher recurrence rate.<sup>[4,21]</sup> Therefore, in obese patients who require CST and/or IFT, a minimally invasive approach (laparoendoscopic techniques) should be considered. Additionally, the impact of IFT (traction stitches) on SSI remains unclear. Because of traction and possible tissue

ischemia, the incidence of SSI must always be included into the postoperative follow up.

Our data on IFT show good initial results. However, our experience is limited and follow-up has not exceeded 1 year.

## Conclusions

IFT system in W3 (sometimes W2) incisional hernias is neither a revolution nor an emergency exit. It should not be regarded as a magic wand, but rather as a possible adjunct management technique to minimize wide tissue preparation (CS) and avoid potential complications. In our opinion it should not be seen as a replacement for other techniques (BTA, pneumoperitoneum-PPP, CS). IFT can spare or limit widespread tissue dissection of (unilateral or bilateral) TAR. It is most valuable in the defects of the linea alba (midline hernias). IFT could be a useful tool in decision-making regarding W3 (sometimes W2) incisional hernia repairs in the future. More patients/studies are needed for a better evaluation of risks and benefits of the IFT.

## Limitations

Owing to the lack of scientific data on IFT, the only valid reference which supports our positive findings is the operative series of Niebuhr *et al.*<sup>[12]</sup> This represents a certain bias, yet it does not deny the good surgical results seen in both patients. However, long-term follow-up is necessary to confirm the described outcome. Furthermore, due to the large transversal hernia gap (20 cm) in patient 2, both BTA and IFT were used in order to achieve the approximation of the linea alba. Therefore, it is not clear from our data to what extent the relative approximation of the linea alba resulted from BTA and IFT, respectively. From our previous published data<sup>[20]</sup> the approximation effect of BTA in 35 pts was variable, within a range of 1–3 cm bilaterally. In the case of patient 2, the effect of BTA did not exceed 3 cm either. Thus, the good fascial approximation (despite bridging) in patient 2 should mostly be the effect of the IFT. It still remains unclear, however, to what extent BTA improved the effect of IFT. More data and a multivariate analysis of facilitating effects on the approximation of linea alba are needed to better evaluate these positive results.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

## Conflicts of interest

Dr. Jurij Gorjanc is an Editorial Board member of *International Journal of Abdominal Wall and Hernia Surgery*. The article was subject to the journal's standard procedures, with peer review handled independently of this Editorial Board member and their research groups.

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