

# The use of a new kind of low profile retractor for arteriovenous fistula procedure simplifies and speeds up the intervention

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**Abstract: Purpose:** The aim of this study was to demonstrate the effectiveness of a new kind of disposable surgical retractor in arteriovenous fistula (AVF) procedures in order to achieve an easier, faster and safer surgical intervention.

**Methods:** Between January and June 2008, 22 AVF procedures were performed using the 3PAWS ReeTrakt™ (In-sightra Inc. - Irvine, Ca., USA) a self-retaining, low profile retractor. An equivalent patient sample, in which an AVF was performed using conventional retraction devices, was considered for comparison of the intra- and post-operative results.

**Results:** In all of the 22 AVF procedures performed, the ReeTrakt™ system has simplified the performance of the surgical team. The retractors were very easy to place. The view of the operating field was always optimal. The introduction of the surgical instruments was at all times extremely easy and unrestricted. We also noted a reduction in the operating time (from an average of 67 min in controls to 43 min). There were no intra-operative complications. No post-operative complications related to the use of this kind of device occurred. Conversely, the amount of intra- and post-operative complications in the control group managed with conventional retraction devices was marginally higher than in the ReeTrakt™ patient group.

**Conclusion:** The ReeTrakt™ system is a very simple and useful low profile retractor for AVF procedures. Its ultra low profile allows a much improved view of the operating field, an unhindered insertion of the surgical instruments and a shortening of intervention time, avoiding the problems which arise as a result of standard retractors typically used during this kind of procedure. Due to absolute perpendicular retraction it offers a highly atraumatic performance, avoiding swelling and marks on the insertion sites. Therefore, in our opinion, it has the potential to reduce the risk of wound oedema, hematomas or infection associated with the AVF procedure. This is important as many patients are elderly with fragile tissues. (J Vasc Access 2009; 10: 33-6)

**Key words:** Arteriovenous fistula, Surgical fixation devices

## INTRODUCTION

The arteriovenous fistula (AVF) procedure, due to technical difficulties related to anatomical variability, depth and/or distance between the artery and vein, as well as the different thickness of the subcutaneous fat in the forearm, often makes the procedure challenging. These challenges can result in sub-optimal procedures with a high degree of complications and, importantly, occlusion of the anastomosis.

Due to these limitations we are convinced that obtaining a wide and effective retraction is a critical step

in avoiding an awkward approach to the surgery; and therefore, reducing the risks of post-operative complications.

The aim of this report was to demonstrate the effectiveness of a new kind of low profile surgical retractor, the 3PAWS ReeTrakt™ which, in our opinion, through a more efficient and stable retraction allows better vision, and approach of the surgical instruments when performing the arteriovenous anastomosis. Its simple low profile design, associated with a great flexibility in placement and regulation of the hooks, allows an easy, safe and unhindered surgical performance.



Fig. 1 - The disposable 3PAWS ReeTrakt™ device.



Fig. 2 - Trouble-free fastening of the ReeTrakt™ adhesive base onto the forearm.

## METHODS

Between January and June 2008, 22 AVF procedures were performed using the 3PAWS ReeTrakt™ retractor (Insightra Inc. - Irvine, Ca. USA). All procedures were performed in the forearm, 16 patients had a primary distal anastomosis between the radial artery and cephalic vein, six other patients a redo proximal anastomosis between the radial or interossea artery and a vein of the superficial venous network. In order to compare the mean operating time, as well as the intra- and post-operative complications related to the surgeries performed with the ReeTrakt™ system, we also retrospectively collected a comparative patient sample in which the same surgical procedure was performed using standard retraction. In this control group, 16 patients underwent a primary distal anastomosis between the radial artery and cephalic vein, and six other patients underwent a redo proximal anastomosis between the radial or interossea artery and a superficial vein using conventional retraction devices.

The ReeTrakt™ apparatus design consists of a flexible sticky base pad bonded to a slim retraction strap. This strap passes through the end of the 3PAWS ergonomic curved hook. The hook is made of transparent polycarbonate (Fig. 1). The adhesive base is easy to apply to the skin once the protective backing has been removed (Fig. 2). The adhesive base is adhered to the skin, at a suitable distance from the incision. The hook is engaged at the edge of the wound. In order to achieve an optimal retraction, the strap is pulled until adequate tension is achieved. Once appropriate retraction is attained, the strap (with one half of the Velcro) is applied down onto

the base (with the opposite part of the Velcro) where the two halves of the Velcro engage and secure the retractor. The hooks were placed symmetrically on opposite sides of the wound edges. In all the distal fistulas, except one, we used two retractors (Fig. 3). In the remaining distal procedure, as well as in all six proximal anastomosis between the radial or interossea artery and a superficial vein, the insertion of a third retractor was needed in order to achieve optimal and effective retraction in the deep subfascial lodge of the forearm (Fig. 4).

All the disposable retraction devices (ReeTrakt™) used for the surgical procedures described in this report were provided at no cost by the manufacturer (Insightra Inc., Irvine, Ca., USA). No grant was agreed with this company for drawing up this scientific article.

## RESULTS

In all the 22 AVF procedures performed with the ReeTrakt™ system, we noted that the device simplified the performance of the surgical team. The retractors were very easy to place. The low profile of the retractors improved the visualization of the surgical field compared to standard retraction. The new retractor altered the way we could introduce instruments into the surgical field. The ultra low profile offered the ability to bring instruments parallel to each other, offering a simplified anastomotic technique. The combined factors of better visibility, greater stability (and thus less need to adjust the retractors) and improved instrument access resulted in a reduction in the operating time. With ReeTrakt™ the average operating time within this patient sample was 43



**Fig. 3** - Effective soft tissue retraction during a distal AVF.



**Fig. 4** - Using three samples of the 3PAWS model for retraction in a deep proximal AVF with an anastomosis between the interosseous artery and a superficial vein.

min (range 37-56 min). This compared to the control group, in which the average operation length was 67 min (range 54-82 min). There were no intra-operative or peri-operative complications, such as wound swelling or bleeding in the ReeTrakt™ group and in a 3-month follow-up no thrombosis, hematomas or wound infections were reported. In the control group, we noted four peri-operative swellings and one hematoma of the wound in the subgroup undergoing distal anastomosis (note - the hematoma did not require any surgical treatment), and three peri-operative swellings as well as two hematomas in the subgroup undergoing distal anastomosis. One of these hematomas needed a surgical wound revision with blood clot evacuation. In the 3-month follow-up in the control group, three thromboses occurred in the subgroup with distal anastomosis (two were successfully managed through catheter thrombectomy and one with a revision anastomosis). There were two thromboses in the subgroup of distal anastomosis, one was managed with thrombectomy, and the other with a new AVF in the opposite forearm.

## DISCUSSION

The disposable 3PAWS retractor helped efficiently in performing all the AVF surgeries with very good results. The unimpeded view allowed by the straps, which follow the contours of the body and wrap around the arm keeping an ultra low profile, has, in our opinion, allowed a better quality of anastomosis. The greater flexibility of the tips, together with the progressive controlled retraction, permits an appro-

priate atraumatic placement in the subcutaneous fat. The view of the operating field is further improved by the ergonomic design and the transparency of the polycarbonate material used to manufacture the hooks. The property of the polycarbonate hook is also very useful in avoiding accidental tissue burns during thermo-cauterization in comparison to metallic retractor blades. Importantly in this type of patient, no swelling or marks were noted over the retracted skin or fat at the end of the intervention. In addition, the lack of hands and heads in the field of operation, resulting from the stability of the retraction, simplifies the surgical procedure without hindrance during the placement of the surgical instruments. The inherent stability of the retractors, different from current self retainers that are often unstable, allows a consistent and constant retraction. The adhesive base always gave a perfect and steady bonding to the skin, allowing, if needed, countless adjustments of the straps and hooks in order to get optimal retraction. Of note, the base remained firmly adhered to the skin even when, as often occurs in this kind of procedure, the operating field was bathed with saline solution (used to wash the vessels to be anastomosed). All the described properties of the ReeTrakt™ have contributed to the significant reduction in procedure duration, in comparison with conventional retraction in the control group. This is probably related to the “free hand” effect of the assistant, which becomes concentrated in helping the operator not occupied by wound retraction. This was even noted in cases of difficult anastomosis such as the deep artery anastomosis. In these cases, or when a deep retraction was needed,



the simple insertion of a third retractor always optimized the view of the operating field. These properties could probably explain the lack of peri-operative complications in the ReeTrakt™ group compared to the morbidity in the control group. In our opinion, the nearly complication free results at 3 months follow-up for patients in the ReeTrakt™ group could be attributable to the unrestricted sight of the operating field and the steadiness of the retraction. This advantage allows the operators to concentrate on the quality of the anastomosis with the assistance of a fully freed up assistant. Conversely, if a comparison is made with the outcomes of the 3-month follow-up, the results of the control group seem to be clearly worse, although these correspond to the rate of late complications reported in the literature (1, 2). With regard to the results, we are convinced of the effectiveness of these simple but useful devices. In our opinion, in the case of simple distal AVF the use of the ReeTrakt™ could completely eliminate the need for an assistant to retract, permitting a single surgeon to carry on the intervention with a valuable resource and costs saving. Due to absolute perpendicular retraction it offers a genuine atraumatic performance, avoiding swelling and marks on the insertion sites, thus in our opinion reducing the risk of wound oedema or infection. Reduced procedure time, possible elimination of an assistant in some cases, improved anastomosis and reduced wound complications associated with this system could bring important economic benefits more than justifying the move to a disposable system. Con-

sidering all of these benefits the cost of about 20 Euro per retractor is easily recuperated in global savings.

At present there are no specific reusable retraction systems which can be directly compared with the ReeTrakt™ disposable retractors. Other modern retraction devices are actually available, these are however not usable in AVF procedures (3-5). The lack of other comparable retraction devices makes the ReeTrakt™ retraction tool a unique system which, in our opinion, can improve surgical outcomes when used in AVF procedures. In addition, as reported in recent literature (6), this device could be considered by the surgical community in the outlining of a protocol regarding the logistic, as well as the surgical approach, to be employed in AVF procedures. In this regard, we believe that the simple and useful disposable retraction device described can be a further step aiming to standardize and optimize this kind of surgical treatment.

Conflict of interest statement: Dr. G. Amato is a paid consultant to Inshitra Medical. None of the other authors has any conflict of interest.

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## REFERENCES

1. Keuter XH, De Smet AA, Kessels AG, van der Sande FM, Welten RJ, Tordoir JH. A randomized multicenter study of the outcome of brachial-basilic arteriovenous fistula and prosthetic brachial-antecubital forearm loop as vascular access for hemodialysis. *J Vasc Surg* 2008; 47: 395-401.
2. Schuman E, Standage BA, Ragsdale JW, Heintz P. Achieving vascular access success in the quality outcomes era. *Am J Surg* 2004; 187: 585-9.
3. Dominguez FJ, Black DM, Kawaguchi AL, O'Malley CA, Hughes KS. Elastic stay hooks and self-retaining retractor technique for mastectomy skin flaps. *Surgery* 2007; 141: 272-4.
4. Carriero A, Dal Borgo P, Pucciani F. Stapled mucosal prolapsectomy for haemorrhoidal prolapse with Lone Star Retractor System. *Tech Coloproctol* 2001; 5: 41-6.
5. Zimmerman DD, Briel JW, Gosselink MP, Schouten WR. Anocutaneous advancement flap repair of transsphincteric fistulas. *Dis Colon Rectum* 2001; 44: 1474-80.
6. Flu H, Breslau PJ, Krol-van Straaten JM, Hamming JF, Lardenoye JW. The effect of implementation of an optimized care protocol on the outcome of arteriovenous hemodialysis access surgery. *J Vasc Surg* 2008; 48: 659-68.