Arthroscopic Bankart Repair using Biodegradable Suture Anchors with a Retrograde Technique

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Fig 1
Panalok® - Panacryl™, long-term, biodegradable suture anchor system.

Introduction

The purpose of this presentation is to report our experience with a new arthroscopic stabilizing technique using strong long-term biodegradable PANALOK® - PANACRYL™* suture anchors combined with a retrograde technique and a special kind of slipknot.

Numerous studies have documented the functional significance of the anterior-inferior capsular labral complex, IGHL, in maintaining the stability of the glenohumeral joint (1, 3). Therefore, a technique that achieves reattachment of the labrum, combined with the possibility of capsular plication to obtain more capsular tension is required (9).

Background

Since 1996 we used arthroscopic Bankart repair technique as described by E. Wolf (9), with a Mitek GII®* anchor and the PDS®* II (Polydioxanone) in 60 patients with posttraumatic instabilities.

In our first series of 30 patients we encountered several technical problems, the main problem being breakage of the PDS® suture in 5 cases. Also in our second series, the vulnerability of PDS® posed some difficulties. Furthermore, in cases of reoperation we found metal components in the glenoid. For all these reasons, a search was made for a new strong long-term resorbable suture with less elasticity and vulnerability than PDS® and with a strong biodegradable suture anchor.

Suture anchor system

To simplify arthroscopic Bankart repair, we need a strong biodegradable suture anchor with high pull-out forces similar to the Mitek GII® (6). Since 1998 the Panalok® - Panacryl™ suture anchor combination is available in Austria **(Fig 1)** . The anchor consists of 100 % biocompatible Poly L-lactic acid, PLLA, its maximum diameter being 4.06 mm and its maximum length, 6.79 mm. Biodegradation begins after 12 months. Panacryl is made of 95 % PLA, Polylactidacid and 5 % PGA, Polyglyconate. It is a braided and coated suture which retains 80 % of its strength through three months and is fully resorbable. In order to use this device we had to modify the arthroscopic technique.

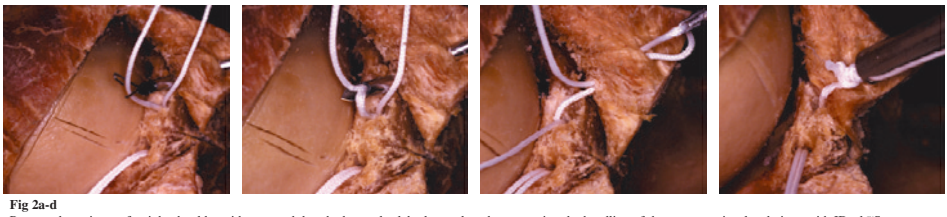


Fig 2a-d
Preserved specimen of a right shoulder with prepared detached capsular-labral complex, demonstrating the handling of the suture retrieval technique with IDeal ™Suture Grasper® and slipknot.

Anatomical studies

In anatomical cadaver studies we determined the appropriate diameter for anchor drill holes and tested the correct handling of retrograding instruments for the suture retrieval technique **(Fig 2a-d)**. In our practice, the diameter of the correct drill hole in the glenoid rim is 3.2 mm and its depth, 18 to 20 mm. After testing some devices for suture retrieval, we found the IDeal™ Suture Grasper / Innovasive Devices®* with a 60° angle to be the proper instrument **(Fig 2, 7, 9)**. With this retrograding instrument we are able to pierce the capsular labral complex as deep and wide as necessary to perform good plication and to restore the Bankart lesion. To achieve secure refixation of the capsular labral complex with high pressure we use an extraarticular safe and strong self-locking slipknot. After testing several knots we decided to perform the Endoloop according to Melzer and Buess (2). This knot was developed in colorectal surgery for vessel ligature and also to define the limits of resection. It is a safe and strong slipknot, as shown in the literature (7) **(Fig 8)**

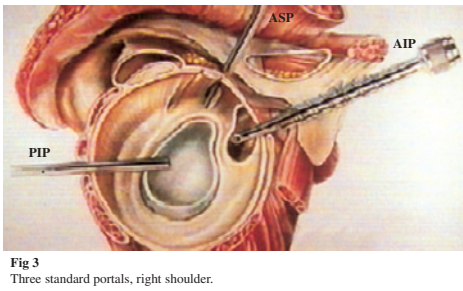


Fig 3
Three standard portals, right shoulder.

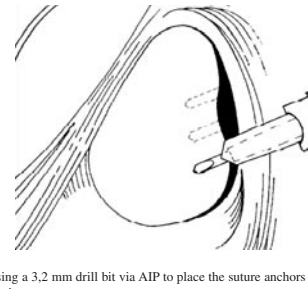


Fig4
Drilling, using a 3,2 mm drill bit via AIP to place the suture anchors on the edge of the glenoid rim.

Patient Selection
All 20 patients had incurred their instability from traumatic dislocation. The apprehension sign was positive in all cases; no sulcus sign was observed during load and shift tests. In all cases the dislocation was confirmed on radiographs. After reduction, true anteroposterior and axillary views were obtained to ensure that congruence had been achieved. All of these patients underwent contrast MRI to demonstrate the capsular labral pathology.

Setup and Positioning
We perform shoulder arthroscopy with the patient in a beach chair position. The affected arm is held in 20° of abduction and is extended by a right-angled elbow brace with 2 kg traction weight (4). We prefer this setup because the risk of a traction lesion of the brachial plexus is less and good control of arm rotation is obtained. We also use a sterile cushion in the armpit as a hypomochlion.

Arthroscopic procedure
After scrubbing and dressing we palpate and mark the posterior and anterior lateral edge of the acromion, the coracoid tip and the intended portals. We use the same 3 portals, namely posterior inferior PIP, anterior inferior AIP and anterior superior ASP, as described by E. Wolf (8) **(Fig 3)**. We then insert the camera via PIP and inspect the capsular labral detachment. Under arthroscopic visualization we insert a needle from anterior to achieve ideal angulation to the glenoid rim and the Bankart lesion. We never establish the AIP more distally than 2 cm to the coracoid process in order to avoid damaging the axillary and musculocutaneous nerve (5). The next step is to establish the ASP under arthroscopic visualization. We enter the joint at the level of the biceps tendon in the most superior portion of the rotator cuff interval. After examination from the PIP we change the camera to the ASP. The PIP is used for the outflow cannula. Again the structures of the capsular labral complex are visualized from the ASP, especially the anterior-inferior corner.

The anterior rim of the glenoid cavity and the scapular neck is prepared; a rasp, an aggressive shaver and a burr via the AIP are used to prepare the scapular neck and to create a decorticated fibroplastic bed with bleeding bone. We also refresh the surface of the detached capsular labral complex for better bleeding and healing. Before we start with drilling we check the quality of the capsule and labrum by using a soft tissue grasper.

Drill holes, anchor placement
Via AIP we set a threaded 8.5-mm working cannula and the drill holes are made with a 3.2-mm custom-made drill bit **(Fig 4)** . The drill is inserted through a special slotted drill guide to prepare the holes for Panalok from inferior to superior, step by step. Once the hole is drilled we push a Panalok® combined with Panacryl™ through the slotted cannula and without tapping we insert it into the bone **(Fig 5a,b)**. The anchor turns 20° in the bone tunnel and after anchor placement we carefully apply strong traction on both threads of the Panacryl™ to block the anchor firmly into the cancellous bone and to avoid damage by extraction of the inserter through the drill guide. Thereafter we extract the drill guide. **(Fig 6a-d)**.

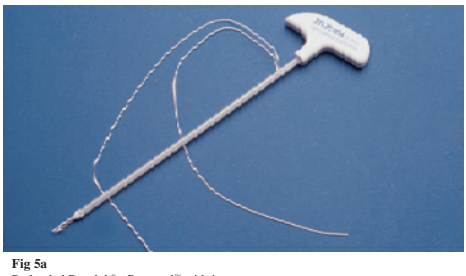


Fig 5a
Preloaded Panalok® - Panacryl™ with inserter.

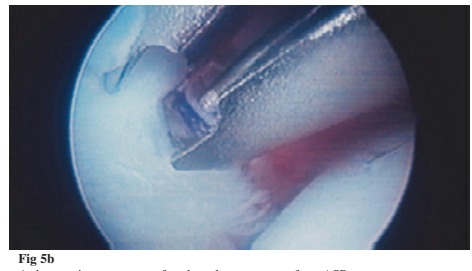


Fig 5b
Arthroscopic appearance of anchor placement seen from ASP.

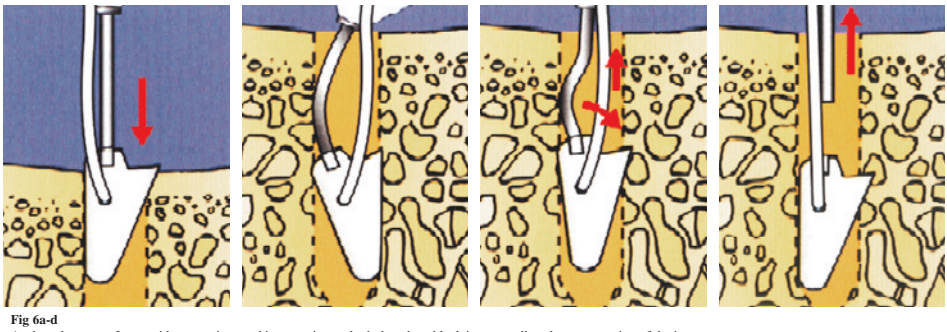


Fig 6a-d
Anchor placement. Insert without tapping, pushing, traction on both threads to block into cancellous bone, extraction of the inserter.

Retrograding instrument (Fig 2,7,9a-d)
We place a retrograding IDeal™ Suture Grasper via AIP in the joint and pierce the capsular labral complex as far inferior as possible. When the quality of the pierced tissue is satisfactory, we capture one limb of the Panacryl into the snare of the instrument. Again, we carefully pass the capsular labral complex. It is important to use this kind of device carefully, as the suture may otherwise be broken or perforated once the anchor has been set.

Extraarticular self-locking slipknot (Fig 8)
An extraarticular Endoloop is then tied. It starts with a double throw. One head of the thread is twisted three times around the other and the knot is completed by a double-blocking passage. By traction on one end of the Panacryl™ thread, it is usually possible to slide the knot through the cannula. To achieve good compression on the reattached tissue we use a simple knot pusher with a cutting device **(Fig 10)**. Two or three suture anchors are commonly used **(Fig 11)**. Each suture produces a capsular plication, a so-called neo-labrum. After tying the last knot we check our reattachment by probe from the ASP and PIP. The arthroscopic instruments are extracted and, after closing the wound with simple stitches, the shoulder is filled with 10 ml Naropin 2 mg/ml (Ropivacain hydrochloride monohydrate). A compression bandage and a shoulder immobilizer are applied.

Postoperative care
The patients are asked to refrain from overhead activities for 3 weeks and external rotation for 6 weeks. They wear an immobilizer for 3 weeks night and day and for 1 additional week at night. Extension of the elbow is allowed from the day of operation. Physiotherapy and a home exercise program are started 2 weeks after surgery, with active and passive ROM. After 6 weeks a more aggressive rehabilitation program is started and external rotation is allowed. Return to overhead actvities or team contact sports is allowed after 4 months.

Results
Since 8/1998 we have performed this new arthroscopic suture anchor technique for Bankart repair in cases of first and recurrent shoulder dislocations in more than 20 patients. Obviously the mean follow-up of 12 months is too short; a longer follow-up period and a subsequent report of the same will be presented at a later point in time. The average age of our 20 patients is 30 years. According to the criteria of C. Rowe the mean result was 94 points, the mean constant score, 96. The average external rotation deficit in comparison to the contralateral shoulder with the arm in adduction was 5°. All 20 patients returned to full daily or sports activities. No re-dislocations have been observed during the short follow-up period since surgery.

Pitfalls
This procedure is an extremely demanding technique and should be performed by highly experienced surgeons. Extensive cadaver training is required to handle the retrograder in an appropriate and safe fashion. In spite of fulfilling these conditions, in 3 cases we injured the braided suture during the retrieval technique and had to repair the suture or replace it by a new suture anchor system. No recurrence, lesion of nerves, infection, or synovitis reaction due to biodegradation of the suture anchor system have been observed so far.

Summary
This new procedure has been performed in 20 patients over a 15-month period. This new kode of arthroscopic stabilization with long-term biodegradable suture anchors appears to be an effective method to treat unidirectional anterior inferior instability. The technique allows the surgeon to perform capsular plication and to achieve nearly anatomical restoration by way of creating a neo-labrum. We leave no metal components in the glenoid and, so far, have encountered no foreign body reaction of the PLLA anchors during biodegradation.

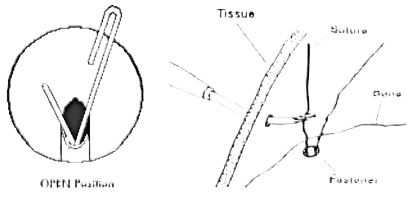
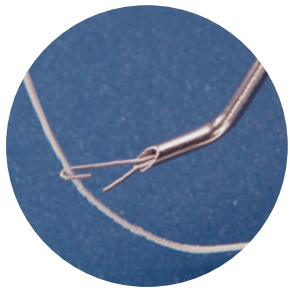
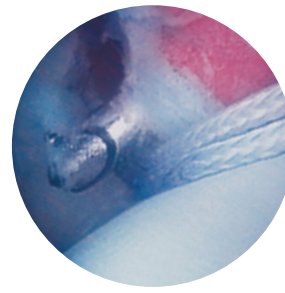


Fig 7
Suture retrieval technique with IDeal™ Suture Grasper®.

Fig 8
Extraarticular self-locking slipknot according to Melzer & Buess.

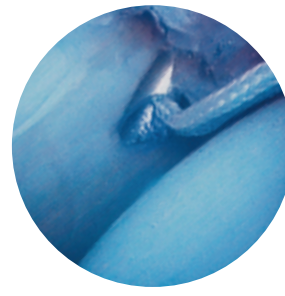


Fig 9a-d
IDeal™ Suture Grasper 60°. Pierce the detached capsular labral complex in closed position.
Capture one limb of the Panacryl™ into the snare. Retract Grasper with one thread trough the detached tissue and out of cannula, seen from ASP.

Fig 10
Compression of the reattached tissue by Melzer-Buess slip knot with knot pusher.

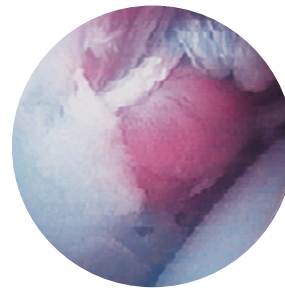


Fig 11
Arthroscopic repair using Panalok® - Panacryl™ suture anchors as seen from the ASP

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