Operative management of anterior glenohumeral instability

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Recurrent glenohumeral instability is the most comman instability of initial glenohumeral dislocation [9]. Management of glenohumeral instability is focused rather on operative treatment, because nonoperative management, especially in young, active patients, may cause recurrent instability in a high percentage [5,7].

For a precise classification type of instability a detailed preoperativ protocol including history of instability (cause of instability, sports and activity level), clinical examination and ragiographic evaluation (x-rays, CT-Scan) is recommanded.
Matson [9] differentiated between two types of instability. The TUBS group includes patients with traumatic unidirectional shoulder instability, with Bankart lesion, requireing surgery. AMBRI patients are those with atraumatic multidirectional instability, often bilateral, rehabilitation is recommanded. If surgery is needed, an inferior capsular shift should be performed. A more detailed classification was described by Schneeberger and Gerber [16], (Fig.1). Adequate operative management of glenohumeral instability providing a stabile and functional outcome requires different operative techniques. The classification according to Schneeberger and Gerber is favorated giving good orientation for patient and techniques selection.
Following the Innsbruck protocol, the operative techniques, their advantages and limitations, and results will be described and discussed.

Type I	Chronic instability
Type II	Unidirectional instability without hyperlaxity
Type III	Unidirectional instability with multidirectional hyperlaxity
Type IV	Multidirectional instability with multidirectional hyperlaxity
Type V	Multidirectional instability without multidirectional hyperlaxity
Type VI	Voluntary instability (uni- or multidirectional)

Fig.1. Shoulder instability classification according to Schneeberger and Gerber [14]

Three different techniques are used for operative treatment of anterior glenohumeral instability in relationship to type and cause of instability.
-Arthroscopic extra-articular Bankart repair
-Open Bankart procedure (modified)
-J-shaped bone-block procedure (Resch)

Arthroscopic extra-articular Bankart repair

Indications

TUBS-patients, unidirectional instability without hyperlaxity (type II according to Schneeberger and Gerber)
primary dislocation in competitive sports athletes reccurent glenohumeral instability (including SLAP- and Andrews-lesions) < 5 redislocations, age < 40 years good capsule – ligament conditions, normal glenoid

Contraindications

atraumatic unidicectional instability, multi-directional instability with/without multi-directional hyperlaxity (type IV/V according to Schneeberger and Gerber)
bony Bankart fragment or glenoid defects (larger than 10% of the glenoid)
pathology of the glenoid (hypoplastic or flat glenoid, anteversion, sharp glenoid rim)

Advantages

minimal invasive, extra-articular technique provides a perpendicular refixation of the capsule at the anterior-inferior glenoid rim
low morbidity and pain period, short hospitalisation, early recovery and restoration (external rotation) of ROM
(cosmentical attractive)

Disadvantages

careful patient selection is imperative
special cannulated refixation device and cannulated implants (Suretac®) must be available
demanding technique requires two arthroscopic experienced shoulder surgons
higher recurrence rate than open procedures, no long term results

Technique: [4,12,13,17]

Principle of this technique is an arthroscopic imitation of the open Bankart procedure [1], this means a reattachement of the (labral)-capsule-complex to the anterior-inferior rim of the glenoid with concommidant superolateral shift of the redundant (overstreached) capsule.
For an extra-articular repair an anterior-inferior portal through the subscapular muscle is necessary and ensures that the implant is not inserted oblique, but almost perpendicular to the glenoid rim. The extraarticular refixation of the capsule provides a homogeneuous transition between glenoid and the reattached capsule-ligament complex. A sleeve around the head of the implant – as in intraarticular techniques- is avoided and tension in case of external rotation exercises is minimized.

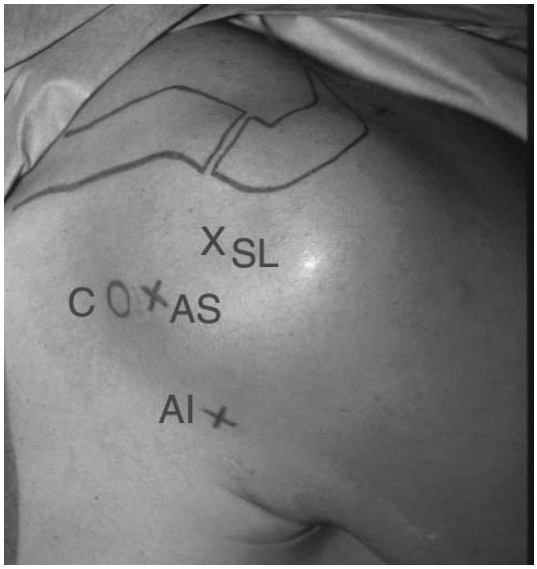


Fig.2. Portals (AS –anterosuperior, AI – anteroinferior, SL – superolateral, C coracoid)

Arthroscopy is performed in beach-chair-position, the arm stays mobile, covered with sterile drapes and adhesive tapes. The elbow is placed in a plastic elbow brace or flexible arm holder.

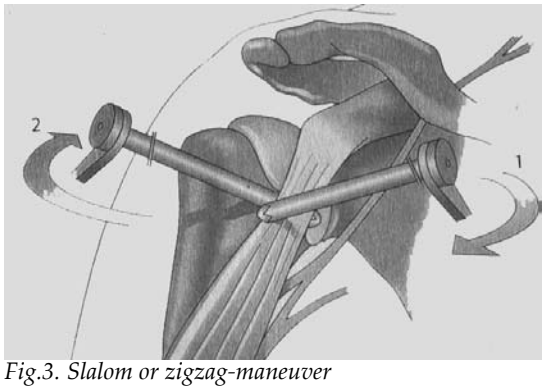
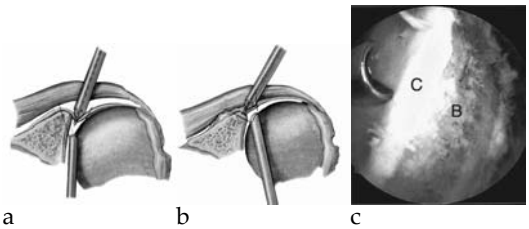


Fig.3. Slalom or zigzag-maneuver

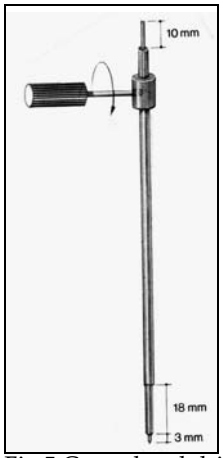
A steril roll can be placed under the axilla like a fulcrum to widen the joint space. 3 (4) portals (Fig.2) are used : posterior portal (1cm distal and medial to the acromial angle for the arthroscope, an anterosuperior portal for instruments and a anteroinferior (transsubscapular) portal for the extraarticular refixation (2-3 cm below the coracoid process). An additional superolateral portal may be useful for visualisation and controling the preparation and drilling at the glenoid rim (Fig.4c). Note: to avoid damage of the musculocutaneous nerve the anterior portals must be made not medial to the coracoid process.



a b c

Fig.4 a-c Refixation technique part I (7c arthroscopic view of the prepared anterior glenoid rim via superolateral portal, C=cartilage, B=bone)

After diagnostic arthroscopy the anterosuperior portal is made, using a 1mm pin, introduced through the rotator cuff interval, directly above the subscapularis tendon, a working cannula is screwed in over the pin. With the help of a probe the Bankart leson is identified, using a Bankart elevatorium, Bankart rasp and shaver the anterior socket of the glenoid is prepared, remaining parts of the labrum are removed cranially and caudally, finely a longitudinal through is shaved into the bony rim to create a slight bleeding bed for refixation. Good visualisation can be achieved using a superolateral portal for the arthroscope (Fig 4c.)



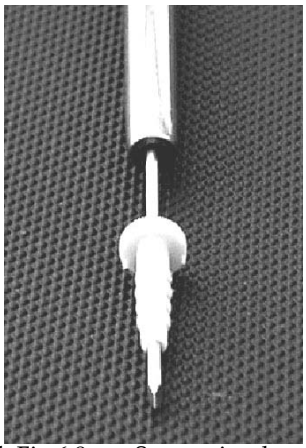
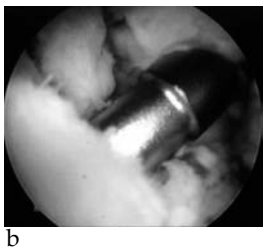


Fig.5 Cannulated drill Fig.6 8mm Suretac implant

Now the surgeon changes position and stands in front of the patients, the assistance controls the camera and the probe. The third portal 2-3 cm

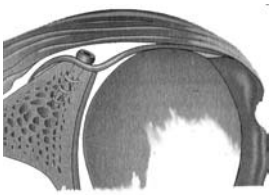
distal the coracoid process is made with the arm in 30°-40° exernal rotation. To reach the capsule from extra-articular and to prevent the musculocutaneous nerv a zigzag-maneuver [4,11,12,17] is necessary (Fig.3).

a



b

Fig.7a-c Refixation technique part II (7b: arthroscopic view of the drill)



c

The trocar sheath with a cannulated trocar penetrates first the subcutaneous soft tissue, then the deltoid muscle is penetrated in a transverse, dorsolateral direction towards the humeral head, then the trocar turned dorsomedially, and slipped lateral of the conjoined tendon to penetrate the subscapularis muscle, after this maneuver the bulgling of the capsule into the joint can be seen arthroscopically. The optimal perforation point in the anterior part of the capsule is marked with an 1mm pin inserted through the cannulated trocar (the arm remains in an external rotation of 35°-40° to prevent postoperative ROM-limitation) (Fig.4a-c). The trocar sheath remains in position and a cannulated drill with a locked guidewire inside (Fig.5) is inserted into the trocar sheath and perforates the capsule at the marked point. The guidewire protrudes the drill about 3-4 mm, with the tip of the pin (can be seen intraarticularly) the perforated labral-capsule complex is shifted cranially and pressed into the bone of the prepared glenoid rim. The assistent visualizes the correct position of the drill (3-4 mm medial to the cartilage-bone-border) by lifting the capsule from the bone using a probe and - if made - by inserting the arthroscope through the superolateral portal. The drill with the locked pin is drilled into the bone in a slight dorsomedial direction until a marked stop (18 mm) on the drill. The pin is then unlocked and trapped 3-4 mm in the posterior cortex. Then the drill is removed manually, the pin remains in situ as a guidewire for the 8 mm Suretac® implant (Fig.6) and is pushed forward with a driver. It is recommended, to insert the top of the Suretac® frist by hand into the bony hole, otherwise the guidewire can bend and the implant will brake, when using the hammer to early. After the insertion is controled arthroscopically, using a hammer the last two third of the implant is impacted into the bone and presses the capsule against the bone (Fig.7 a-c). The reattachment of the capsule is carfully checked with the probe. A second 8 mm Suretac® is introduced 1,5-2 cm superior to the first implant. Finaly with a careful external rotation of 40° both the reattachment and the thightening of the capsule is checked under arthroscopic view via posterior and superolateral portal. Lesion above the 3 o'clock (right shoulder) and SLAP lesions are managed from intraarticular by using 6 mm Suretac®.

Open Bankart procedure (modified)

Indications

TUBS-patients, reccurent glenohumeral instability
unidirectional (traumatic) instability without hyperlaxity (type II according to Schneeberger and Gerber)
unidirectional with hyperlaxity including interval-lesions (type III according to Schneeberger and Gerber)
multidirectional instability without multidirectional hyperlaxity (type V) according to Schneeberger and Gerber) – two different traumas
no limitation regarding to number of redislocations and age
small glenoid defects (< 20% of the glenoid, < 15% with competitive overhead activities)

Contraindications

multidirectional instability with multidirectional hyperlaxity (type IV according to Schneeberger and Gerber)
bony Bankart fragment or glenoid defects (larger than 20% of the anterior-inferior glenoid rim)
pathology of the glenoid (hypoplastic or flat glenoid, anteversion, sharp rim)

Advantages

reliable technique – anatomical repair (advocated as golden standard technique)
good learning curve, one shoulder surgon nessesary
low recurrence and complication rate, good functional outcome

Disadvantages

limitation of external rotation and limitation of overhead activities by scaring
overtightening of the capsule may cause capsulorhaphy arthropathy
higher morbidity than arthroscopic procedures

Technique [1,15,19]

Principle is an anatomical capsulolabral reconstruction at the point of the lesion at the

anteroinferior glenoid rim. That means refixation of the avulsed labral-capsule-ligament complex to the anteroinferior glenoid without shaving off bone from the anterior glenoid or thightening the anterior capsule or shortening of the subscapularis tendon. Anterior capsule laxity in case of atraumatic instability or hyperlaxity or in combination with a bankart lesion can be managed with a selective capsular shift procedure according to Warner [22].
The patient is positioned in a beach-chair position with the arm lying on an additional small table.
The skin is incised from the coracoid process to the anterior axillary crease, the deltoideopectoral sulcus and the cephalic vain are identified, the vain is retracted laterally, the sulcus is opened blunt with the two index fingers, with retractors the muscles are hold laterally and medially, so the conjoined tendon of the coracoid muscles and after external rotation of the arm the tendon of the subscapularis muscle are visible. In our opinion osteotomy of the coracoid is not nessesary, a small oblique incision of the conjoined tendon is enough for exploration of the underlying structures. The tendon of the subscapularis is marked with two sutures, sharply incised vertically (at the inferior border of the tendon the incision turns medially to prevent the axillary nerv) and splitted from the capsule. The capsule is inspected, an intervall-lesion is closed with absorble sutures. The capsule is incised like a T, the vertical limb of the capsular incision is made 0,5 cm medial the insertion of the subscapularis tendon, the long horizontal limb runs towards the middle (incisura) of the glenoid. The labral-capsule-periostal tissue is removed in toto from the anterior glenoid neck until the posterior inferior egde of the glenoid. Careful subperiostal preparation at the inferior part of the glenoid is recommended to avoid damage of the axillary nerv. The labral-capsule periostal tissue is retracted medially and inferiorly with sharp-tipped levering retractors, the humeral head is retracted laterally, and this provides an excellent view of the anteroinferior scapular neck and the glenoid cavity. After roughening of the anterior, non articular surface of the glenoid using a olive burr, in the 5, 3:30, and 2 o'clock (in a right shoulder) position 3 drill holes are made, non metallic (absorbable) suture anchors with No.1 nonabsorbable sutures are inserted. Starting from inferior to superior the sutures are passed at the anatomical point (labral) from inside of the joint to extraarticular through the capsular tissue. The knots are tied and the capsule tissue is pressed against the glenoid anterior rim (or in a preformed drilled sulcus) reestablishing a smooth continuity between the articular surface and the capsule. After Bankart repair, closure of the capsule is managed with a selective capsular T-shift procedure according to Warner [22]. Therefore the arm is positioned in an abduction of 60° , flexion of 10° and external rotation of about 35°. Finaly the subscapularis tendon is repaired anatomically without shortening. Suturing of the oblique incision of the concoined tendon, stepwise closure of the deltoideopectoral groove and of the wound.

J-shaped bone-block procedure (Resch[11])

Indications

reccurent traumatic glenohumeral instability with bony anteroinferior glenoid defect (avulsion
or fracture (old), defects > 20%, 15% with competitive overhead activities
glenoid patholoy
unidirectional with hyperlaxity including interval-lesions (type III according to Schneeberger
and Gerber) in case of competitive overhead athlets
revision surgery

Contraindications

multidirectional instability with multidirectional hyperlaxity (typ IV/V according to Schneeberger and Gerber)

Advantages

anatomical reconstruction of the glenoid cavity in case of glenoid defects
restoration of full stability and full ROM, especially for throwing and overhead athlets
compareable to primary outcome in case of revision surgery
low recurrence rate

Disadvantages

requires bone block from the iliac chrest
demanding technique (potential risk of complete osteotomy or inadequate change of the anatomy of the glenoid cavity)

Technique [11,21]

Principle is an intraarticular anatomical bony repair of the avulsed anterior deficiency of the glenoid. Restabilisation of the shoulder focus on the reestablished anatomy of the glenoid cavity with regard to bone defect and curvature and not on tightening of the anterior capsule. Therefore a selectiv capsular T-shift procedure without shortening of the capsule provides postoperative motion and function especially in patient with overhead activities.
Patient positioning and surgical approach are simmilar to the open Bankart procedure, for harvesting of the bone block an additional sterilisation and taping of the iliac chrest is nesessary.
After the anterior glenoid and scapular neck are exposed, all soft tissue and periost has to be removed, it is essential to create a plane bed for the bone graft to reach a pressfit implantation. The

osteotomy is performed 5mm medial the bone-cartilage border, the osteotome is directed in slight dorsomedial direction (not parallel – potential risk of an iatrogenic glenoid fracture) to create a 2 cm long vertical gap, the depth of the gap is about 1-1,5 cm. (Fig.8). With the osteotom the gap is carefully opened to ensure a complete and stable implantation of the bone-block.

Fig 8 (below). Osteotomy at the anterior inferior surface of the scapular neck

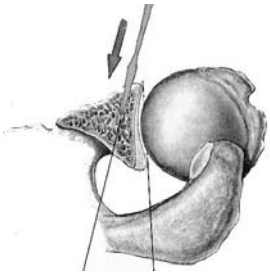
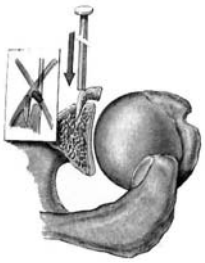


Fig 9 J-shaped bone block

A bone block from the anterior to middle part of the illiac chrest is harvested, in this part of the iliac chrest the corticalis runs almost rectangled form the top to the side, the outer cortecalis ist stronger than the inner one. The size of the block depends on the size of the glenoid defect, in most cases an 1cm deep, 1cm broad and 1,5 long cortical bone-block is harvested and is shaped like a J by removing spongious bone using an oszillating saw (Fig.9)



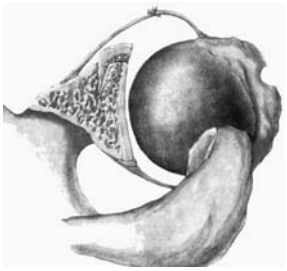


Fig.10.(left) Intraarticular implantation of the bone block.
Fig.11. (right) Implanted bone block enlarging the articular surface of the glenoid

Before implanting the J-shaped bone block, the glenoid neck surface is cleaned and the gap is carfully opened again. With a spezial holder the bone block is fixed and than implanted first manually with the longer and thinner limb into the gap, finely a pressfit contact to the surface of the glenoid neck is reached by impacting the block using a special driver (with a spike) and a hammer. Note: to avoid a breakage of the short limb of the J, it is essential to apply the force on the driver in direction of the long limb of the J (Fig.10). The glenoid enlarging part of the block is carfully contoured to provide a congruent surface and curvature of the glenoid cavity (Fig.11, Fig.12). The capsule is closed (the bone block is located completely intraarticular) similar to the open Bankart procedure without tightening of the capsule.

Fig.12. Implanted bone-block (intra-operative picture, R=retractor, G=glenoid cavity, J=boneblock)

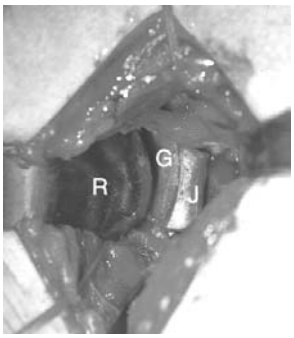


Fig.13.(Below) Post-Operative complications

	AS	Bankart	Bone-block
Recurrence	9,7	5,5	1,1
Frozen	3,6	0,9	1,1
Allergic	3,0	0	0
Fracture	0	0	1,1
HPO	0	0	1,1
Nerv	0	0	0
Infection	0	0	0
All	16,3	6,4	4,4

Postoperative Protocol

(similar for all 3 techniques)

Discharge from the hospital ranges from one (arthroscopic procedure) to five (J-shaped bone block) days. The operated shoulder is immobilised for 3 week with an ordinary shoulder sling.
To garantee an optimal functional outcome timeplan and quality of the physiotherapy are important. Too early ROM-exercises and mobilisation of the shoulder joint compromises shoulder stability. The purpose of the therapy is not mobilisation (as in case of rotator cuff repair) but proprioception exercises.
From the 1st to the 3rd week: no mobilisation or passiv ROM exercises, lymphdrainage, isometric shoulder centration exercises.
From the 3rd to 6th week : shoulder sling is removed, the patient is allowed to rise his (her) arm to 90° in a saggital plane, and 60° in a frontal plane (abduction), external rotation is limitated until 0°. Further physiotherapy contains proprioception training and underwater therapy.
From the 6th week ROM in all planes are allowed. Only in case of excessive limitation of external rotation mobilisation of the shoulder joint starts. Any abrupt load to the shoulder joint or overhead exercises, especially in abduction and external rotation should be avoided.
From the 12th postoperative week a special focused propriocepion training starts in the preoperative sports and/or overhead activities.

Full sports activities are allowed, when „functional stability" is achieved, this is usually possible 6 month postoperatively, and can be expected in overhead sports at least after 8 to 10 month after the index stabilisation.

Results

A total of 365 patients, who were operated between 1985 and 1994 for the reason of recurrent shoulder dislocations were followed up. All patients reported a history of recurrent anterior dislocations and instability was documented by physical examination as well as examination under anaestisea. 110 patients had been managed with the open Bankart procedure, an arthroscopic extraarticular repair was done in 165 patients and 90 patients were treated with a J-shaped bone block procedure. by a kind of cartilage (white arrow).

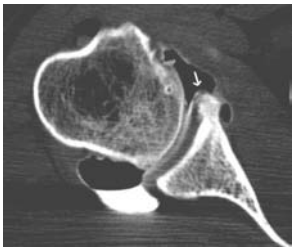


Fig.14 (Left) Overhead athlete, 6 years follow up after open Bankart repair, 20° loss of external rotation, severe (stage II) osteoarthrosis
Fig.15 (Right) Postoperative CT with air contrast after J-shaped bone block procedure, perfect ingrow of the bone-block, anatomical reconstruction of the anterior glenoid and of the cavity curvature, note: the bone block is covered

There were no significant difference in age and sex in the differnt groups. The follow up evaluation was performed on an average of 53 month (18-120 month) postoperatively. The follow up for the arthroscopic repairs (34 month) were shorther than for the open procedures. For evaluation of pre- and postoperative sports activities, sports were subdivided into three risk groups: overhead sports/contact sports, shoulder demanding sports (e.g. skiing, soccer), and low risk sports (e.g. walking, jogging).
Functional results were rated with the Score according to Rowe [15], excellent and good results were reached with all three techniques. Results with the open Bankart procedure were classified as excellent and good in 91% (fair 3.5%, poor 5.5%), postoperative recurrence rate was 5.5%. With the arthroscopic Bankart repair: 80,6% excellent and good results (fair 10,4%, poor 9.7%), recurrences: 9.7%. The results using the J-shaped bone-block were rated as excellent and good in 95,5%, (fair 3,4%, poor 1,1%, 1 patient (1,1%) suffered a postoperative traumatic recurrence. The bone block procedure provided the best results in overhead activities, 79% of the overhead athletes returned to their preoperative sports and reached their preoperative athletic level in 68.2%, in the open Bankart group 74% of the overhead athletes returned to their preoperative sports activity, while in the arthroscopic Bankart group only 58% of the overhead athletes returned to their preoperative sports (51% reached their preoperative athletic level). Before trauma the part of overhead and contact sports athletes was high in the bone block group (55,7%) and also in the arthroscopic group (46,6%), while only 38% of the patients indicated a high risk sports before treated with an open Bankart procedure.

Complications

Overall postoperative complication rate was 16,3% (arthrocopic), 6,4% (open Bankart) and 4,4% in the bone block group. (Fig.13).
In patients with longtime results degenerative signs at the glenoid and/or the humeral head were evaluated on plane radiographs and divided into three stages (according to Rosenberg [14]). Stage I osteoarthrotic sign in 17 longterm results of J-shaped boneblock procedures were identified in 25,5%, but there was no severe osteoarthrosis (stage II or III), while in the open Bankart group with an overall osteoarthrosis rate of 18,6% also stage II (%) and stage III(%) signs were found. The follow up in the arthroscopic group was too short to evaluate osteoarthrosis.

Discussion

Recurrent glenohumeral instability is the most comman instability of initial glenohumeral dislocation [9]. Most patients with atraumatic glenohumeral instability, especially with multidirectional instability, benefit from nonoperative treatment [9]. Management of traumatic glenohumeral instability is focused rather on operative treatment, because nonoperative management, especially in young, active patients, may cause recurrent instability in a high percentage [5,7].
To select patients for operative treatment and for the optimal stabilisation technique a detailed preoperative protocol is recommanded to find a precise classification of the type of glenohumeral instability. Therefore history of instability, sports and overhead activities are essential. With a careful clinical examination including shoulder stability tests (apprehesion test, relocation test, load test, sulcus sign) degree and direction(s) of instability are defined. With plane radiographs and CT-scans (with air contrast) fractures of the glenoid and the humeral head, as well as avulsions of the labral-capsule complex (Bankart lesion, capsule laxity) and glenoid pathology are detected. For quantification of glenoid defects, as an important factor of glenohumeral instability [2,3,6], one of our authors (M.R.) developed a special CT protocol. In spiral CT-scan with multislice technique both shoulders are

computered and the glenoid cavity is reconstructed two and three dimensional.
With clinical tests, ultrasound and injection test rotator cuff tears are identified, which may occur in elder patient after shoulder dislocation.
After this preoperative evaluation patients with multidirectional instability with multdiractional hyperlaxity (type IV according to Schneeberger and Gerber) and patients with volontary instability (type VI) can be excluded from operative management. The remaining patients were subdivided in patients with atraumatic and traumatic instability. For typ of instability the classification according to Schneeberger [14] is favorated. In contrast to Matson [9] (TUBS and AMBRI) Schneeberger also includes patients with preexisting atraumatic instability or hyperlaxity and shoulder trauma or patients with two different traumas and therefore a multidirectional instability without hyperlaxity (type V). This patients will benefit from opertive stabilisation (type V requires anterior and posterior reconstruction).
In the opinion of the Innsbruck shoulder unit different types of glenohumeral instability cannot be managed with one operative technique alone [20]. Therefore three different techniques were used for operative treatment of anterior glenohumeral instability in relationship to type of instability. Only patients without relevant glenoid defect of 5% (AS) to 20% (open) are selected for labralcapsule repair (arthroscopic or open repair). Patients with more than 20% (>15% in patients with contact sports or overhead activities) bone loss require a reconstruction with a J-shaped bone block [11,21].
The open Bankart procedure provides a stable repair of the labral-capsule complex to the prepared glenoid using suture anchors, an additional capsular shift (selective T-shift according to Warner [22]) can be performed to shorten the redundant capsule [1,15,19]. The presented arthroscopic technique tries to imitate the open Bankart procedure [4,13,17]. The keys of this arthroscopic technique are insertion of the implants at the anterioinferior glenoid rim (region of the lesion) and a superomedial shift, and can be reached by an anteroinferior transmuscular portal. In an anatomical study this approach using the slalom maneuver was studied, the risk of damage of the neuromuscular structures are minimized by passing the conjoined tendon laterally [12]. In the study it was also shown, that the tendon of the subscapularis lies lateral to the anterior glenoid in case of external rotation. In this position the blunt trocar does not pass through the tendon, but easily penetrates the muscle fibers of the subscapularis towards the capsule tissue [13]. However, this arthroscopic technique provides a stabile, functionally postoperative outcome with a minimal invasive technique, but there are some disadantages and limitations. You may be confronted with intraoperative problems [4,18], as breakage and bending of the guidewire, fracture and loss of implants or the implant cuts through the capsule (6mm Suretac without spikes), bulging out of the glenoid cartilage in case of too lateral implantation. That means, a appropriate training status of two shoulder surgons is recommanded, not only to perform this arthroscopic technique, but also to have knowlegde of intraoperative problems as well as to find intraoperative solutions [4].
An analysis of our failures (Fig.13] reveals, that in the open Bankart procedure only overhead athletes redislocated their shoulder postoperatively [19], this patients had their first dislocation during overhead sports activities, the recurrence occured during overhead activities, and the patients returned early and without physiotherapy to their sports activities. In the arthroscopic group also patients with shoulder demanding sports were affected [4,13,20]. A significantly large population of patients with postoperative recurrences had preoperatively no or only a small Bankart lesion and capsule laxity.
Recent literature recommand an anatomical bony repair in case of anterior glenoid deficiencies to restore stability and function [2,3,9,21]. In former literature bone block procedures were presented, most of them not anatomically and placed extraarticulary, causing severe osteoarthrosis in a high percentage [10,23]. But overtightening of the anterior capsule to reach stability in a glenoid deficient instabile shoulder leds to an excessive loss of external rotation and therefore function (Fig.14), and causes osteoarthrosis when overhead activities are continued postoperatively [14,21]. In literature acceptable degree of anterior bone loss for a labral-capsular repair alone range from 20% - 33% [3,9,21], but this recommandations are often personal experiences without basic sience background. Burkhart et De Beer [2] found a high reccurence rate after arthroscopic Bankart repair in patients with significant bone defects. In a cadaver study Itio found an increasing instability with an osseous defect with a width that is at least 21% of the glenoid lenghth and may limit the range of motion of the shoulder in addition (shortening of the capsule), if a Bankart repair is done [6]. In our follow up, patients with a large glenoid defect (>20%) and bony repair of the defect with an intraarticular J-shaped bone block provided a stabile result with a high functional outcome. Long term radiological results indicate that bony repair prevent and not cause osteoarthrosis [21] (Fig.15). Finely the J-shaped bone block procedure is addressed to patients requiring revision surgery. The outcome in our follow up evaluation especially in the overhead athlets were equal to primary repair [21], while other authors [8] stated, that the results after revision stabilisation (Bankart repair and capsular shift) are not as predictable as for primary surgery.

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