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Bony Bankart Lesions: Fundamental Concepts to Understand and Treat Them

Lesión de Bony Bankart: Conceptos fundamentales para su comprensión y tratamiento

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Abstract

Bony lesions of the anterior glenoid rim secondary to an episode of anterior instability of the shoulder are increasingly being reported. Known as a bony Bankart lesion, its presence generates a loss of static glenohumeral stability that causes an increased risk of a new dislocation event. Therefore, it is essential that orthopedic surgeons correctly and accurately diagnose these injuries to assess the need to restore the glenoid articular surface. The purpose of the present narrative review is to provide the essential concepts of the bony Bankart lesion to properly understand and deal with this type of injury.

Keywords

- bony Bankart lesion
- anterior glenoid rim fracture
- glenoid bone defect
- recurrent instability
- shoulder dislocation

Resumen

Las lesiones óseas en el borde anterior glenoideo secundarias a un episodio de inestabilidad anterior del hombro cada vez son más reportadas. Conocidas como lesión de "Bony Bankart", su presencia genera una pérdida de la estabilidad estática glenohumeral que provoca un aumento del riesgo de un nuevo evento de luxación. Por ende, resulta fundamental que los cirujanos ortopédicos comprendan y diagnostiquen estas lesiones de forma correcta y oportuna para evaluar la necesidad de restaurar la superficie articular glenoidea. El objetivo de esta revisión narrativa es otorgar los conceptos más importantes de la lesión ósea de Bankart para comprender y enfrentar de forma adecuada esta lesión.

Nivel de Evidencia V

Palabras claves

- lesión de Bankart óseo
- fractura del anillo anterior glenoideo
- defecto óseo glenoideo
- inestabilidad recurrente
- luxación de hombro

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Introduction

Bankart lesions correspond to a disinsertion of the anteroinferior glenoid labrum secondary to a traumatic event of anterior instability of the shoulder.[1] When this lesion is accompanied by a fracture of the same anterior glenoid rim, it corresponds to a bony Bankart (BB) lesion.[2] The described incidence of BB lesions is between 8.6% and 41% in a first dislocation event, which increases to 50% to 86% in patients with recurrent events.[3]

It is often a challenge to understand and group the different anatomical concepts presented in the literature regarding to this injury. Concepts such as “bone defect” and glenoid “bone fragment” are part of the BB lesion.[3] The former corresponds to the loss of the glenoid articular surface, while the latter is the residual fracture that detaches from the glenoid, and both are secondary to a traumatic event. Glenoid bone defects are not always accompanied by bone fragments. Acute injuries are those that are found within the first three months of the first traumatic event.[4] In them, the presence of a bone fragment is expected, unlike chronic injuries (found within less than three months), in which we can find smaller fragments, but still present, or even completely resorbed or eroded chronic glenoid defects, both without bone fragments.[5] It is essential to distinguish the group of patients with an acute or chronic BB with a *bone fragment present* from the group of patients with recurrent anterior instability with *chronic glenoid defects*. This last group is characterized by the absence of a viable fragment for fixation and joint reconstruction, and therefore requires a different management than that of the first group; this chronic glenoid defect can generate significant structural damage, decreasing shoulder stability, and requiring a bone block as a surgical intervention,[6] unlike the first group, in whom fixation and eventual consolidation of the fragment could be attempted.[3,4,7–11]

In recent years, orthopedic surgeons have been aware of the increase in bone injuries secondary to shoulder instability events.[3,12] There is an increasing trend to reduce and fix BB injuries due to the risk of apprehension, redislocation, or developing glenohumeral osteoarthritis.[5,12] Therefore, understanding the importance of a fracture in the anterior glenoid rim will enable us to better analyze the patient in order to define the most appropriate course of action. The objective of the present review is to provide the most important concepts regarding the BB injury to understand and adequately treat it. Thus, we included all published articles that analyzed the anatomy and radiological and/or functional results of a BB lesion.

Anatomical analysis of BB lesions

Resorption

Throughout the last decade, Nakagawa et al.[5,8,13,18] carried out a series of studies to understand the behavior of BB lesions. First, they[5] analyzed why patients with BB lesions could have “large” glenoid defects associated with “small” bone fragments.[5] Their hypothesis was that the fragments could undergo resorption over time, and this would generate a size discrepancy between the bone defect and the fragment in the glenoid (►**Figure 1**). By investigating[5] 163 shoulders with recurrent anterior instability using three-dimensional reconstruction in computed tomography (CT) scans, they were able to show that all patients with BB lesions not submitted to surgery experienced resorption of the affected bone fragment and glenoid rim. This resorption turned out to be *time-dependent*, because the average rate of resorption of the fragment was of 51% in lesions with less than 1 year, of 65% in those between 1 and 2 years, and of 70% in those with more than 2 years. This reaffirmed the importance of measuring the glenoid defect when planning surgery, as well as the size of the residual bone fragment, which could be insufficient to achieve glenoid reconstruction. The fragment can even be absent at the time of the evaluation, which can be attributed to two reasons: *complete resorption* over time, in which the edges became straight and pointed, or because a significant fragment never existed and the bone defect ended in an *erosion* with round and compressive edges.

Thus, since all bone fragments undergo resorption over time, increasing the size discrepancy between the defect and the fragment and, therefore, the probability of a recurrence, Nakagawa et al.[5] recommend: 1) *early repair before the fragment undergoes significant resorption; and* 2) *measuring the size of the glenoid defect and the residual bone fragment prior to surgery, in order to assess whether reconstruction of the articular surface is feasible.*

Union

In a second article, Nakagawa et al.[8] described how the size of the bone fragment influences consolidation, and whether this union affects the recurrence rate. Therefore, they analyzed the union rate of 81 shoulders with BB lesions subjected to the Bankart repair[8] in 3 different follow-up periods, and showed that the rate of union was *time-dependent*. The rate of union increased significantly ($p = 0.0005$), reaching 84% in the third period (> 1 year of follow-up). In addition, the rate was also *dependent on the size of the fragment*. The rate of union in the cases of large fragments (> 10% of the glenoid width) was of 84%, which was significantly higher ($p = 0.04$) than that of the cases of small fragments (< 5%), of only 42%.

For the analysis of the influence of the rate of union on recurrence, they[8] analyzed 53 patients who underwent CT with 6 months of evolution and with a minimum follow-up of 12 months. These patients had an overall nonunion rate of 15% and a recurrence rate of 22%. In this group, when comparing those with union versus partial union or nonunion, the rate of postoperative recurrence in the first group was of 6%, which was significantly lower ($p = 0.0002$) than that of the second group (50%), showing that the union of the fragment decreases the risk of recurrence.

Remodeling

In the aforementioned study,[8] the change in size that the consolidated fragment could undergo during follow-up was analyzed. In 33 patients with fragment union, the pre- and

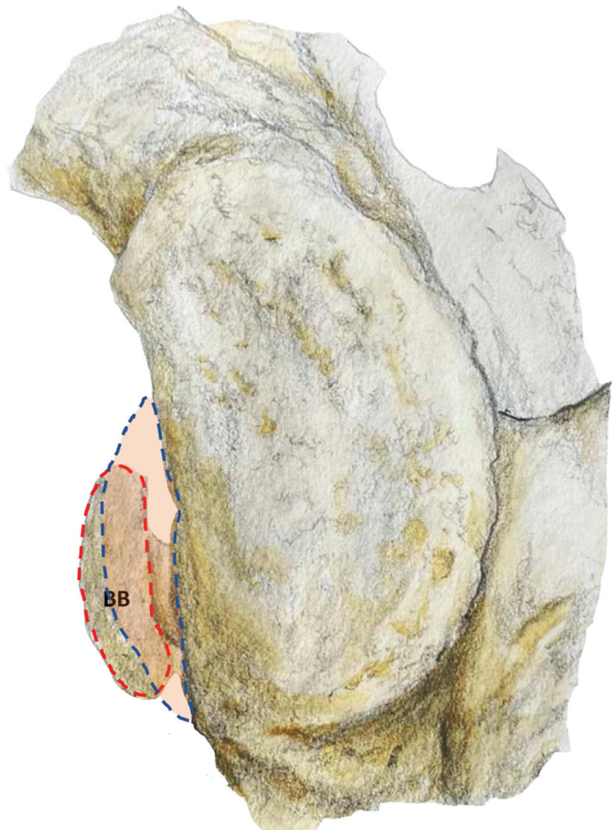

Fig. 1 Illustration of the size discrepancy between the glenoid defect (blue dotted line – orange area) and the bone fragment present in a chronic bony Bankart lesion (red dotted line). Abbreviation: BB, bony Bankart lesion.

postoperative sizes were compared by CT. "New bone formation" around the consolidated fragment was observed in 88% of the patients, and no fragment with union underwent resorption. This confirmed a remodeling process in which the fragment increases in size and, at the same time, the size of the glenoid defect decreases. The latter decreased from an average of 18% to 4% ($p = 0.0001$), and 17 patients ended up with a final glenoid defect of 0%. This was corroborated in a subsequent study[13] analyzing athletes of contact sports undergoing arthroscopic repair of BB lesions. All fragments that achieved union increased in size from 8% to 15% on average, while the glenoid defect decreased from 18% to 2.8% on average. Final glenoid defects < 5% presented a 5% recurrence, and, in the group with defects > 5%, it reached 38% ($p < 0.003$) (►**Figure 2**).

From these findings, we can conclude that: 1) *not all operated fragments heal;* 2) *most take more than 6 months to heal;* 3) *the larger the fragment, the higher the rate of union;* 4) *the higher the rate of union, the lower the rate of recurrence; and* 5) *the remodeling of a consolidated fragment is frequent.*

Preclinical factors to consider

The presence of bone lesion at the glenoid rim may increase the risk of a new episode of dislocation or generate different degrees of functional limitation.[3,6,14] Knowing the main predisposing factors for a new episode of dislocation is essential, since the sum of these suggests the need for surgical intervention. The meta-analysis carried out by Olds et al.[15] and other articles[6,11,14,16] describe the following predisposing factors for recurrent instability:

1. *Age and physical activity*: patients aged > 40 years have a lower rate of recurrence (44 versus 11%).[15] In contrast, athletes aged < 20 years reach an odds ratio of 12 for recurrence.[17]
2. *Gender:* men are three times more likely to have recurrent instability than women.[15]
3. *Temporality*: time plays an important role in both recurrence and postoperative results. Porcellini et al.[16] observed that the rate of recurrence of patients operated on in the chronic stage was almost double that of those submitted to surgery in the acute stage (4.2 versus 2.4 respectively).
4. *Glenoid bone defect and size of the bone fragment*: previously described by Nakagawa et al.,[5,8] they are part of the

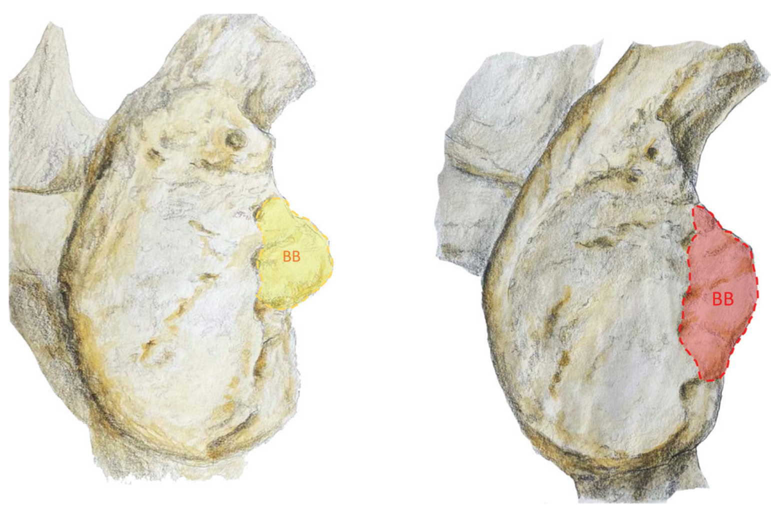

Fig. 2 Illustration of the consolidation of the bone fragment with bone filling around it (red area with dotted line), demostrating remodeling and reduction of the bone defect. Abbreviation: BB, bony Bankart lesion.

most influential factors in the recurrence rate, which increases as the size of the glenoid defect also increases. Burkhart and DeBeer[6] described a recurrence rate of 64% with defects > 25%. Saha et al.[11] obtained unacceptable functional results with defects > 13.5% in patients undergoing capsulolabral repair. Dickens et al.[14] demonstrated that patients with a glenoid defect > 13.5% had a higher rate of recurrence after the Bankart repair. It should be noted that all of these series correspond to chronic glenoid defects without the presence of a bone fragment. Regardless of the size of the glenoid defect, if the fragment subjected to reduction and fixation manages to consolidate, the risk of recurrence decreases significantly.[13]

5. *Bipolar injuries:* the combination of a glenoid defect with a Hill-Sachs (HS) lesion increases the risk of a new dislocation event.[18] An analysis using CT in bipolar lesions showed that the extension of the HS lesion negatively influences the rate of postoperative recurrence, regardless of whether the HS lesion is off-track or not.[13] After repair surgery for the BB lesion, the most influential factor in recurrence was the consolidation of the bone fragment, also regardless of whether the HS lesion was off-track.[18]

Indications for surgery

The main indications for surgery reported in the literature for BB lesions are: recurrent instability, residual glenohumeral apprehension, and subluxated head on imaging studies.[3,19–21] In addition, we consider it essential to differentiate the group with *anterior glenoid rim fractures* from the group with *chronic glenoid defects*. For the first group, good functional results and a low rate of recurrence have been reported with the conservative management, especially in small defects < 5% to 10% of the glenoid articular surface (anteroposterior axis).[22,23] Maquieira et al.[24] reported satisfactory results with the conservative management in bone fragments > 5 mm and centered humeral head. They did not present apprehension, recurrence or signs of osteoarthritis at 5.6 years of follow-up. Spiegl et al.[25] performed the conservative management for all glenoid defects < 5%, and did not observe significant differences ($p = 0.98$) in the Rowe Score (RS) when compared to that of the surgical group with defects > 5%. However, 25% of the conservative group presented postsurgical apprehension. The longest cohort with the longest follow-up regarding the conservative management was published by Wieser et al.[26] All patients with IB fractures in the Ideberg classification, regardless of the size and displacement of the fragment, were treated conservatively, since all corresponded to a first event. With an average follow-up of 9 years, 3% presented recurrence and 10% reported poor functional results. The union rate was of 100%, the anatomical remodeling reached 79%, and 23% of the patients developed osteoarthritis secondary to the traumatic event. The authors[26] concluded that their good results were due to the fact that all the cases corresponded to first events, with the CTs showing a centered humeral head. Therefore, those *fractures of the anterior glenoid rim* corresponding to a first episode could be managed conservatively, especially those that compromise less than 5% of the glenoid width. In fractures compromising > 10% to 12.5% of the glenoid surface associated with subluxated heads, reduction and fixation of the fragment is recommended to restore glenohumeral stability. This is suggested in the acute stage due to the greater probability of consolidation of the fragment and to avoid resorption as much as possible.[3,10,19]

On the other hand, for the second group, if the chronic glenoid defect is symptomatic, either due to apprehension or recurrence, the recommendation is joint reconstruction using a bone block due to the absence of a bone fragment.[19,27–30]

Surgical techniques

Throughout the past two decades, different surgical techniques have been reported, in an evolution from open surgery to arthroscopic surgery. Regardless of the technique used, we believe that it is crucial to understand that the ideal course of action for BB lesions with a bone fragment is to try to reduce and fix them as early as possible. Thus, it is essential to study the viability of the fragment, which is determined by its size, and the possibility of achieving a joint reconstruction greater than 80% of the glenoid width. Recovering the glenoid width could be achieved in both the acute and chronic stages, since Fuji et al.[31] have shown through histology that the bone fragments could have biological viability to consolidate even in an advanced chronic stage. This is because degeneration predominates in the ligaments and, to a lesser extent, in the bone. On the other hand, if the patient presents a chronic bone defect without a fragment, usually in the context of recurrent instability, we must choose a technique that provides a bone block to the glenoid.

The main techniques described in the literature are as follows:

1. **Single-row or Sugaya et al.[7] technique**: a method for arthroscopic stabilization with the use of anchors. The bone fragment is reduced and stabilized by fixing the labrum adjacent to the fragment with lower and upper anchors. Anchors can often be added at the level of the fracture ridge, enabling the sutures to wrap or transfix the bone fragment, using a single row at the glenoid (►**Figure 3**).
2. **Arthroscopic double-row or Bony Bankart Bridge (BBB) repair**:[32] unlike the previous technique, this arthroscopic method uses a second row of anchors. It consists of the implantation of an anchor medial to the fracture at the level of the glenoid neck. Its sutures are passed around the fragment, transfixing the soft tissues such as the labrum and/or the inferior glenohumeral ligament, and are loaded in a second anchor that will be implanted in the glenoid articular surface, usually at the edge of the fracture line, to anatomically reduce the bone fragment. This creates two fixation points that compress the fragment in the glenoid (►**Figure 4**).
3. **Cannulated screws**:[10] a method for open or arthroscopic reconstruction using cannulated screws to achieve fragment fixation in acute anterior glenoid fractures. It has also been described as a mixed technique, combined with

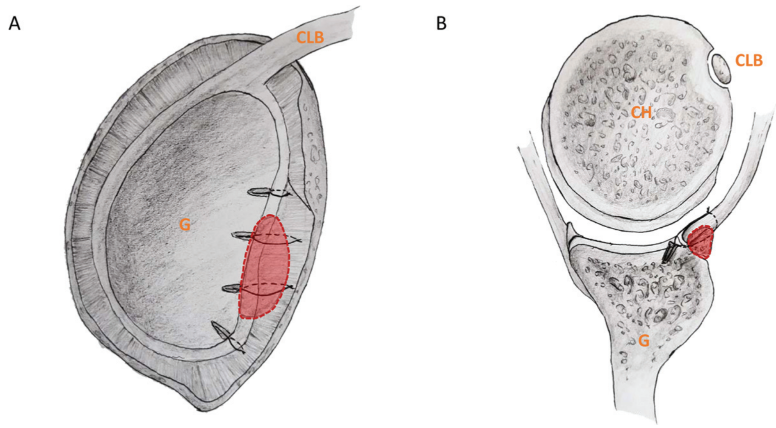

Fig. 3 Illustration of the Sugaya et al.[7] technique in the sagittal (**A**) and axial (**B**) planes. The red area represents the reduced bone fragment fixed by anchors. Abbreviations: CH, humeral head; CLB, long head of bicipital tendon; G, glenoid.

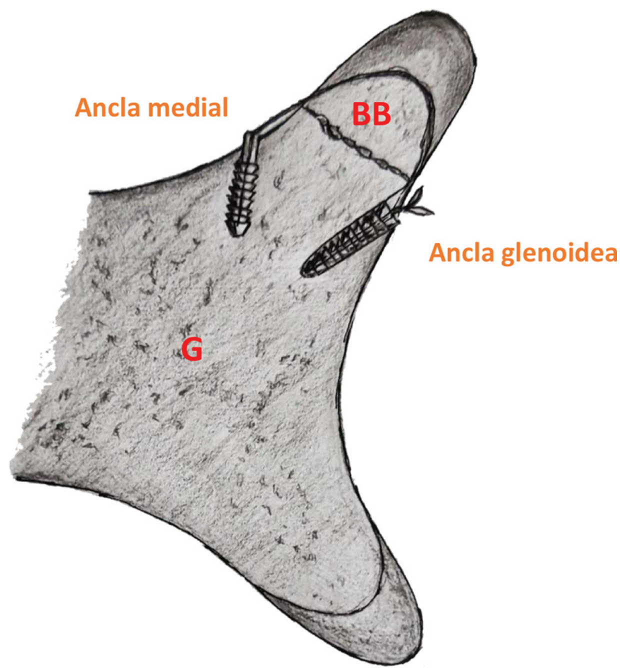

Fig. 4 Illustration of the double-row according to the Bony Bankart Bridge technique. Abbreviations: BB, bony Bankart lesion; G, glenoid. Ancla medial = medial anchor, Ancla glenoidea = glenoid anchor.

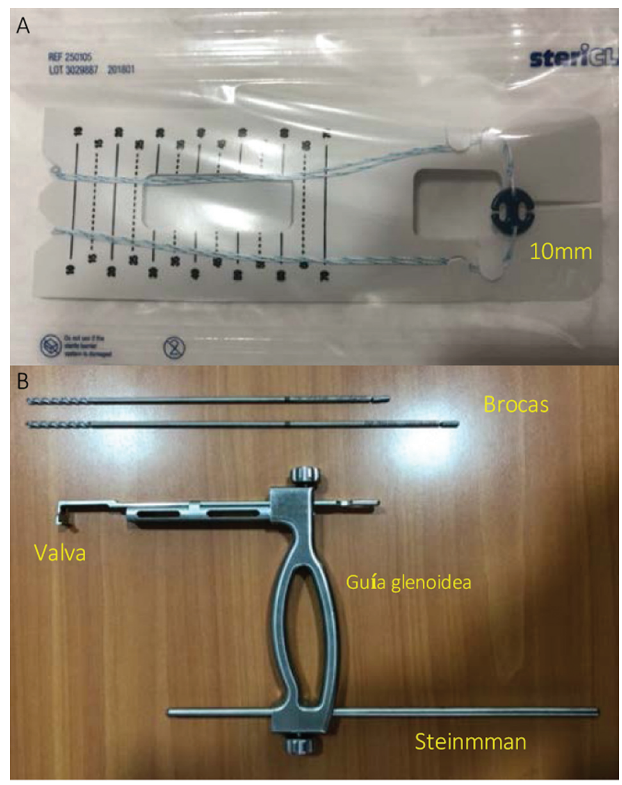

Fig. 5 (**A**) Arthroscopic 10b-mm single-use glenoid button. (**B**) Guidewire with glenoid and coracoid blades, along with short- and long-length drill bits. Brocas = bits, Valvas = valves, Guía gleinodea = gleinod guide, Clavo de Steinmann = Steinmann pin.

previously-described arthroscopic techniques, using 1 or 2 screws measuring 2.7 mm to 3.5mm associated with anchors.

4. **Arthroscopic button**: new fixation method for anterior glenoid fractures based on the technique published by Taverna et al.,[27] in which buttons are used for the fixation of an allograft bone block in a patient with recurrent instability. In the case of BB lesions, one or two buttons are used directly for the fixation of the bone fragment in the acute stage by using a guide (►**Figure 5** and ►**Table 1**). This stabilization method has already been validated even as a stable and rigid construct for Latarjet reconstruction.[33–38] It requires anatomical reduction to achieve optimal stabilization (►**Figure 6**).
5. **Latarjet procedure**: indicated in medium and large chronic glenoid defects, as well as in non-viable bone fragments to be reduced and/or fixed. To date, it is the most widely used technique to manage large chronic glenoid defects.
6. **Iliac crest bone block**: it presents the same indication as that of a Latarjet procedure. It has been validated as a technique with no differences in terms of clinical and imaging results with the Latarjet[30] procedure. It is described as an open or arthroscopic technique with the use

Table 1 Advantages and disadvantages in the use of the arthroscopic button for bony Bankart lesions

Advantages	Disadvantages
The guide is used through the posterior portal to perform glenoid tunneling. The guide reduces the risk of metal implants on the joint surface. The tunnel is made from posterior to anterior, facilitating angulation to implant the button in the glenoid. It does not require an extremely medial anterior portal, reducing the risk of injury to the brachial plexus and to the subscapularis tendon.	For fragments > 8–10mm. Fragments without comminution. Requires an advanced level of arthroscopic experience.

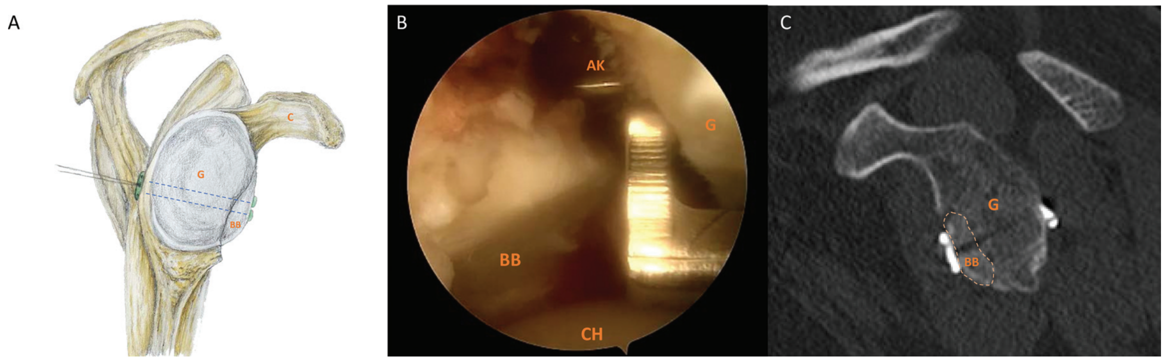

Fig. 6 (**A**) Illustration of button-fixed bone fragment reduction with passage of sutures through the glenoid (gray dotted line). (**B**) View from the anterolateral portal, in which the position of the guide and exit of a Kirschner wire is observed at the level of the fracture line with the bone fragment not reduced. (**C**) Postoperative computed tomography scan with the bone fragment (orange dotted line) reduced. The path of the brocade through the center of the bone fragment is observed. Abbreviations; AK, Kirschner wire; BB, bony Bankart lesion; C, coracoid; CH, humeral head; G, glenoid.

of different implants (screws, buttons, metal-free cerclage etc.) and good functional results.[28,39–43]

To date, the superiority of one technique over the others has not been demonstrated. Most recommendations are based on the size of the glenoid defect. Due to its clinical validation, the classification by Kim et al.[44] is frequently used. In it, the lesions are classified into 3 groups, considering as small lesions those that affect < 12.5% of the width of the inferior glenoid, as medium-sized, those between 12.5% and 25%, and as large, those > 25%.[3,44] Based on these percentages, the main surgical recommendations for BB lesions are: reduction and arthroscopic fixation using anchors for small and medium lesions, while large defects are often fixed with screws or filled with bone blocks when there is no viable bone fragment.[7,19,40,45]

Biomechanical studies

There are few biomechanical studies that have tried to compare the different techniques. Giles et al.[46] compared the Sugaya et al.[7] and BBB techniques for 15% defects in 16 cadaveric specimens, demonstrating that 2-point fixation techniques provide significantly greater fragment stability against concentric and eccentric loads compared to the Sugaya et al.[7] technique, with 1 point of fixation ($p < 0.04$), but without differences in load transfers and contact surface. Spiegl et al.[2] performed a similar study, but with glenoid defects > 25%. Again, the results showed that greater force is needed to displace the fragment in a double-row versus single-row technique ($p = 0.001$). Furthermore, the quality of the reduction was also significantly higher with the double-row technique ($p = 0.005$). Clavert et al.[47] evaluated, in 15 cadaveric pieces, if the addition of a screw to a construct with transosseous repair resulted in any benefits. When comparing the group with anterior glenoid fracture and the controls (native shoulder), the results showed that the transosseous repair technique associated with a screw presents a higher load before failure ($p = 0.02$) and stiffness ($p = 0.001$). However, both techniques were inferior to the native glenoid, which bore almost twice the load. Regarding the use of a button, to date there are no preclinical studies that analyze the properties of the button in BB lesions. Only its safety and stability for the fixation of bone blocks have been demonstrated.[28,34,35]

Clinical Results According to the Surgical Technique

Arthoscopic Repair Using Suture Anchors by Sugaya et al.[7]

Porcellini et al.[4] analyzed the results of a series of 250 patients with anterior instability who underwent arthroscopic repair. In total, 10% of the sample corresponded to BB lesions in the acute stage subjected to a "modified Bankart repair" that consisted of the release and reduction of the bone fragment. During the 2-year follow-up, 92% of these patients maintained a stable shoulder. However, Sugaya et al.[7] were the ones who described the first series with a "new technique" of arthroscopic repair for BB lesions in chronic recurrent anterior instability. They included 42 shoulders with a mean glenoid defect of 24.8%. The score on the RS improved from 33 to 94 points postoperatively ($p < 0.01$), as did the score on the University of California, Los Angeles (UCLA) Shoulder Rating Scale, which increased from 20 to 33 points ($p < 0.01$). Only two patients presented redislocation, and the authors[7] concluded that good results can be obtained with this technique even in large chronic defects. Porcellini et al.[16] published a new series, but only with cases of BB lesions undergoing arthroscopic repair, both acute and chronic. In this article,[16] they managed to demonstrate that patients operated on with fewer than 3 months of evolution present almost double the rate of recurrence (4.2%) than those operated on in the acute period (2.4%), and also have worse scores on the RS ($p = .001$); thus, they concluded that chronic injuries have less favorable results. Kim et al.[44] evaluated a series of patients with BB lesions subjected to two different arthroscopic techniques. They performed conventional capsulolabral repair (without reduction of the fragment) for the group of small lesions (< 12.5%), and the Sugaya et al.[7] technique for medium lesions (of up to 25%). The scores of both groups significantly improved on the RS and Visual Analog Scale (VAS) for pain ($p < 0.05$). In the medium-sized lesion group, 78% of patients achieved anatomic reduction, defined as joint incongruity < 2 mm in the coronal and axial planes on CT. Patients with anatomical reduction presented a significant positive correlation ($p = 0.46$) with the RS score. These last results were consistent with those observed by Jiang et al.,[9] who also analyzed the importance of the quality of the glenoid reconstruction. They included 50 patients with BB lesions and recurrent instability who underwent the Sugaya et al.[7] technique. All patients presented significant improvement in the postoperative scores on the American Shoulder and Elbow Surgeons (ASES), Constant-Murley, and RS scales ($p = < 0.05$), and the recurrence rate was of 8%. When analyzing the quality of the reconstruction using CT, 3 out of the 4 patients who presented failure had < 80% glenoid reconstruction, unlike the successful patients, in whom 100% had > 80% reconstruction. This group[9] recommends estimating the residual articular surface of the bone fragment and the preoperative glenoid to calculate the reconstruction. If the estimated size does not exceed 80% of the native articular surface, a bone graft should be considered to restore the glenoid.

Regarding the influence of the size of the glenoid defect and the presence or absence of a bone fragment, Park et al.[48] conducted a cohort study including 223 patients with recurrent instability undergoing arthroscopic stabilization for their BB lesions. These patients were divided into two groups based on the presence or absence of a bone fragment. Furthermore, each group was analyzed into subgroups according to the size of the glenoid defect. The main finding was that, in patients with defects > 20%, the presence of a fragment yielded better functional scores on the ASES and RS scales ($p = 0.02$ and $p = 0.04$ respectively). Even in the group without bone fragments, the recurrence rate increased significantly with greater preoperative glenoid defects, while the group with bone fragments did not show the same trend. On the other hand, Plath et al.[49] analyzed the union rate of 30 patients with BB lesions who underwent arthroscopic repair. Nonunion was observed in 5 patients (16%), and 4 of them patients corresponded to the group of chronic lesions ($p = 0.031$), so the authors[49] concluded that temporality influences the rate of consolidation. Understanding the importance of an anatomical reduction associated with a timely intervention of the BB lesion has enabled the continuous improvement of the postoperative results of the last series described, even in contact athletes as did Shah et al.[50] in 22 rugby players: 100% of them managed to return to the same preinjury level, with a better percentage of satisfaction.

Bony Bankart Bridge

Millet and Braun[32] were the first to describe the BBB technique. The first series included 15 patients with a mean glenoid defect of 29%. Despite the lack of statistical significance, the score on the ASES scale improved from 81 to 98 points postoperatively, increasing 3 times the minimum score to mark a clinical difference in patients. The recurrence rate was of 7%, associated with a high percentage of satisfaction without major complications. In a second series by Godin et al.[45] (in which Millet is one of the authors) with similar glenoid defects and a minimum follow-up of 5 years, they again show a tendency of improvement in the functional scales with a high rate of satisfaction, and only 3 of the 13 patients presented postoperative apprehension, with need for reoperations. Despite the fact that the samples of those series were small, this technique has been shown to restore shoulder stability and maintain good clinical results in the medium term.

Arthroscopic button

To date, there are no documented series with the use of buttons, only one case report by Taverna et al.[27] with good functional results and successful consolidation at six months. Between 2019 and 2020, 4 technical articles[51–54] were published, in which the most important details of the technique are described with promising results (►**Table 2**).

Cannulated screws

The use of cannulated screws through arthroscopy has been reported more frequently. Cameron[55] was the first to describe the fully arthroscopic reduction and fixation technique using cannulated screws. Tauber et al.[56] described 10 patients with anterior glenoid fracture with a mean glenoid defect of 26%. All underwent closed reduction and arthroscopic fixation in the acute stage with cannulated screws. With a minimum follow-up of 2 years, the average on the RS was of 94 points, with 1 patient with postoperative instability and 1 revision due to clamping with removal of the screw. All patients presented consolidation in anatomical position on postoperative CTs. Scheibel et al.[10,19] presented 2 series, the first with 25 patients undergoing open reconstruction for fractures of the anterior glenoid rim. Cannulated screws were used in ten patients with large glenoid defects. Although good functional results are described,[10] with

Table 2 Technical data, advantages and disadvantages of the arthroscopic button as a fixation technique for bony Bankart lesions

Technical data
Use sutures in the adjacent labrum to manipulate the bone fragment, along with elevators or Wissinger rods. Do not forget to release soft tissues and clean the fracture site so that it does not influence in the reduction. Opening of the posterior capsule with a scalpel to insert a guide through the posterior portal. The guide should be parallel to the articular surface. Support the guide valve against the glenoid using a Steinmann pin from the anterior portal. The height of the guide will depend on the location of the bone fragment. The drill should go through the center of it. In the first instance, position the end of the valve right at the fracture site without the reduced fragment. After corroborating the passage of the drill and/or Kirschner wires through the glenoid in a good position, reduce the bone fragment to the glenoid and complete the brocade. Kirschner wires help to fix the fragment and confirm the position of the guide. Through an anterosuperior portal, introduce a Steinmann pin to separate the subscapularis tendon from the anterior glenoid neck. This will enable you to see the exit of the bits and/or needles. Use only 1 button if the fragment is just over 1 cm^2. In that case, choose the large 10-mm button and keep a needle for antirotation effect. Compression through the buttons must be controlled to avoid collapse of the bone fragment. The same sutures in the adjacent labrum can serve for capsulolabral fixation. This will increase the stability of the construct.

anatomical consolidation in 90% and no recurrence in this group, this technique presented 40% of complications in the early stage, with 3 patients with clamping and 1 with loosening of the screws, and all of them underwent a new intervention to remove the material. It should be noted that the use of the screws was decided based on their size, and this technique was even applied in chronic patients. Ten years later, Scheibel et al.[19] described a similar series of 23 patients, but now undergoing arthroscopic reconstruction, and only in the acute stage. The average number of days from injury to surgery was of 12.4. This series[19] again showed good functional results with an average of 85 points on the Constant-Murley scale and 91 points on the RS. There were no new episodes of dislocation, and, unlike the previous series,[10] there were no complications related to the implants. With a minimum follow-up of 24 months, 7 patients presented signs of glenohumeral osteoarthritis, and the authors[19] did not find a correlation between this and those who remained with a joint step. Spiegl et al.[25] analyzed the results of an algorithm for acute BB lesions after the first dislocation event. Of the 25 patients included, 13 presented average glenoid defects of 15%, which were managed surgically through arthroscopy or the open technique with anchors, screws, or the mixed technique. In total, 54% of the surgical group obtained excellent scores on the RS, with 8% postoperative apprehension, which corresponded to the mixed technique with anchor and screws. The patients did not present complications in relation to the implants, and there were no functional differences between the operated group and the conservative group. However, it is difficult to compare the groups because the non-operated group only had 2% glenoid defects on average.

Iliac crest bone block

The coracoid has been widely used for the reconstruction of chronic glenoid defects.[33,34] However, during the last five years, there has been an increase in the use of the iliac crest, both in open and arthroscopic techniques.[27,29,39,41] Taverna et al.[28] evaluated 26 patients with recurrent instability with glenoid defects $> 15\%$ treated with an iliac crest allograft fixed arthroscopically with a double button. With a minimum follow-up of 2 years, they found an average of 96 points on the RS, 88% of satisfaction and 92% of consolidation on CTs, with optimal graft position. No patient presented postoperative instability. The main indication for the use of the allograft instead of the Latarjet was that they had good glenohumeral soft tissues. These were evaluated arthroscopically, and their good quality was correlated when the patients had had fewer than five episodes of dislocation and fewer than three years from the first dislocation event. Avramidis et al.[43] found similar functional results and satisfaction in a series of 28 patients, but with the use of iliac crest autograft. The average defect size was of 12.4%. Neither did the patients present redislocation or complications related to the implant. The CT showed graft consolidation in 100% of the cases, and only 1 patient presented a subequatorial position of the glenoid. Boehm et al.[40] analyzed 14 patients with recurrent anterior instability with chronic glenoid defects. For the reconstruction, an iliac crest autograft was used, which was fixed with through arthroscopy with two cannulated screws. With a minimum follow-up of 5 years, they found scores of 94 points on the Constant-Murley scale, 89 on the RS, and 87% on the subjective shoulder score. Two patients presented postoperative apprehension: one required capsular plication, while the other presented a new episode of posttraumatic dislocation. The evaluation of the graft through CT showed a union rate of 100%, all in correct position.

In short, there is a wide variety of surgical techniques to manage BB lesions with good functional results and a low rate of complications. To date, there is a lack of studies with longer follow-up that demonstrate the superiority of one over the other. However, they correspond to safe and reproducible techniques for reduction and fixation. The most important factors to consider for in their choice are temporality, the size of the glenoid defect, and the viability of the bone fragment for reconstruction. In addition, the experience of each surgeon will be decisive in choosing one

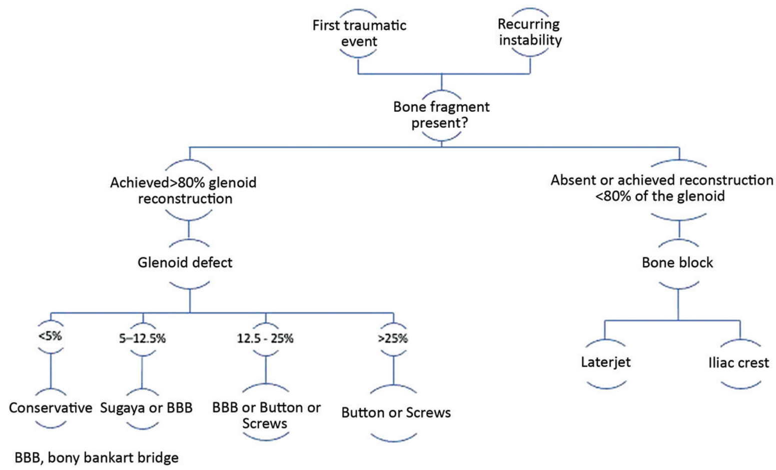

Fig. 7 Algorithm for therapeutic decision in case of bony Bankart lesions. Note: *One must consider that a fracture of the anterior glenoid rim with a centered humeral head could be observable if it corresponds to a first dislocation event, regardless of the size and displacement of the fragment according to the results published by Wieser et al.[26] Primer evento traumático = First traumatic event, Inestabilidad recurrente = Recurring instability, Fragmento óseo presente? = Bone fragment present?, Logra resconstrucción > 80% de la glenoides = Achieved > 80% glenoid reconstruction, Ausente o logra reconstrucción < 80% de la glenoides = Absent or achieved reconstruction < 80% of the glenoid, Defecto glenoideo = Glenoid defect, Bloque óseo = Bone block, Conservador = Conservative, Sugaya et al.[7] o BBB = Sugaya et al.[7] or BBB, BBB o Botón o Tornillos = BBB or Button or Screws, Botón o Tornillos = Button or Screws, Laterjet = Laterjet, Cresta ilíaca = Iliac crest.

technique over the other. ►**Figure 7** describes an algorithm that seeks to guide the therapeutic conduct of the surgeon.

Conclusion

The BB lesion is a great challenge in the clinical practice. A complex analysis is required to carry out the correct treatment. Temporality, the size of the lesion, the quality of the reconstruction and of the consolidation, together with the surgical technique, are fundamental factors to obtain good functional results and a low rate of recurrence.

Conflict of interests
The author has no conflict of interest to declare.

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