

of abduction, with the elbow extended, and be held for five seconds (Figures 6B, 6C).

**Latissimus dorsi strengthening**, also acts as a humeral head depressor. Care must be taken to maintain an upright trunk throughout the movement (Figures 7A, 7B).

**Serratus anterior strengthening**, essential for scapular stabilization. Wall push-up exercises are particularly effective (Figure 7C).

Internal and external rotator cuff exercises with an elastic band, in self-rehabilitation, are often poorly performed and can cause pain in the long biceps tendon. They should not be prescribed systematically and recommended in the treatment of non-operated and operated anterior instability, particularly in patients with hyperlaxity. They are performed isometrically.

### Rehabilitation protocol for non-operated patients

Two out of three patients have been treated conservatively since 1985, based on the described rehabilitation protocol.

### Treatment of the stiff shoulder in flexion

Thousands of patients suffer in all the gestures of daily life and especially at night when they sleep on their side. The clinical examination reveals a painful limitation of the anterior elevation (average up to  $130^\circ$ ), and of the internal rotation of the hand in the back, limited to the hand-buttock, the external rotation can be severely reduced. This painful stiffness is linked either to a tenosynovitis of the long biceps which "sticks" to the bicipital bone groove, or to a true acromial bone conflict, or to a post-traumatic or postoperative too strict and too long immobilization elbow to the body. Often overlooked, this clinical picture can develop into a true adhesive capsulitis. Recovery of joint ranges of motion is achieved on average in three months if the protocol is followed regularly and the patient is motivated. [7–10]

Systematic magnetic resonance imaging (MRI) can demonstrate subacromial bursitis requiring infiltration under ultrasound control. If there is a significant acromial bone spur, arthroscopic subacromial bone decompression could be proposed.

This clinical picture can also be seen in a context of calcific tendinopathy of the cuff diagnosed by a standard radiographic assessment. After infiltration under ultrasound control, a protocol of passive then active assisted mobilization is applied. Strength training exercises, ultrasound and shock waves should be avoided because they are useless and very painful. If the calcium deposit does not disappear spontaneously (90% of cases) and the pain persists despite the infiltrations, arthroscopic excision is proposed.

### Conservative treatment of non-operated full-thickness rotator cuff tears

It is intended for elderly patients, with ruptured tendons, of poor quality making the postoperative functional results uncer-



**Figure 8.** Immediate post-operative passive pendulum exercises, with or without weight (8A); Passive forward elevation controlled with the opposite arm (8B); Passive forward elevation helped with the opposite arm,  $140^\circ$  after cuff repair or shoulder arthroplasty, as tolerated to maximum after subacromial surgery or after capsular release (8C); Post-operative passive external rotation (8D).

tain, or with massive ruptures of two or even three tendons retracted to the glenoid, or finally with medical contraindications for reverse arthroplasty. In all cases, the three types of successive exercises are indicated: passive, active assisted and strength training with a trained physical therapist and a motivated patient in self-rehabilitation three times a day.

- In the first case, the patient presents with a clinical picture of a painful and stiff shoulder. The MRI specifies the existence of an acromial conflict, the extent of the rupture, the quality of the remaining tendons and the degree of fatty muscle degeneration. A protocol of passive mobilization, then active assisted, and finally strength training of the depressors can make a functional and painless shoulder. However, arthroscopic smoothing may be indicated, without repair of the cuff but associated with tenotomy of a very degenerative long biceps tendon, if the pain persists after recovery of mobility [9].
- In the second case of massive and irreparable rupture of the cuff, there may be a clinical picture of a pseudo-paralytic shoulder with the inability to actively raise the arm. Before proposing the placement of a reverse shoulder prosthesis, which is the current trend, it is advisable to