The acute first-time anterior shoulder dislocation (AFASD)
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Citation for published version (APA):
Chapter 5

Reduction techniques of anterior shoulder dislocation, a historical review
THE GENUINE WORKS
OF
HIPPOCRATES

Translated from the Greek
by
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With an Introduction by
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LONDON
BAILLIÈRE, TINDALL & COX
7 and 8 Henrietta Street, Covent Garden, W.C. 2
1898

On the Articulations

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and yet I do not speak decisively respecting it, whether such a dislocation may take place or not. When, then, a dislocation into the armpit takes place, seeing it is of frequent occurrence, many persons know how to reduce it, for it is an easy thing to reach all the methods by which physicians effect the reductions, and the best manner of applying them. The strongest of those methods should be used when the difficulty of reduction is particularly great. The strongest is the method to be last described.

1. Those who are subject to frequent dislocations at the shoulder-joint, are for the most part competent to effect the reduction themselves; for, having introduced the knuckles of the other hand into the armpit, they force the joint upward, and bring the elbow toward the breast. The physician might reduce it in the same manner, if having introduced his fingers into the armpit on the inside of the dislocated joint, he would force it from the rilus, pushing his own hand against the acromium, in order to make counter-pressure, and with his knees applied to the patient's elbow pushing the arm to the sides. It will be of advantage if the operator has strong hands, or the physician may do so directed with his hand and hands, while another person brings the elbow toward the breast. Reduction of the shoulder may also be effected by carrying the fore-arm backward to the spine, and then with the one hand grasping it at the elbow, to bend the arm upward, and with the other to support it behind at the articulation. This mode of reduction, and the one formerly described, are not natural, and yet by rotating the bone of the joint, they force it to return.

2. Those who attempt to perform reduction with the heel, operate in a manner which is an approach to the natural. The patient must lie on the ground upon his back, while the person who is to effect the reduction is seated on the ground upon the side of the dislocation; then the operator, sitting with his hand the affected arm, is to pull it, while with his heel in the armpit he pushes in the contrary direction, the right heel being placed in the right armpit, and the left heel in the left armpit. But a round ball of a suitable size must be placed in the hollow of the armpit; the most convenient are very small and hard balls, formed from

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several pieces of leather sewed together. For without something round it, and some person taking hold of its two ends is to seat the patient upon something, so that his arm can with difficulty pass above the pestle. But for the most part the pestle could not convince them but with difficulty, that the matter was so. But if one will strip the point of the shoulder of its fleshly parts, and where the muscle (deltidium) extents, and also lay bare the tendon that goes from the armpit and clavicle to the breast (pectoral muscle), the head of the humerus will appear to protrude strongly forward, although not dislocated, for the head of the humerus naturally inclines forward, but the rest of the bone is turned outward. The humerus is connected with the breast by the cavity of the axilla, when the arm is stretched along the sides; but when the whole arm is stretched forward, then the head of the humerus is in a line with the cavity of the humerus, and no longer appears to protrude forward. And with regard to the variety we are now treating of, I have not seen a case of dislocation forward.

4. There is another method of reduction performed by the shoulder of a person standing. The physician operating in this way, who should be taller than the patient, is to take hold of his arm and place the sharp point of his own shoulder in the patient's armpit, and push it in so that it may lodge there, and having for his object that the patient may be suspended at his back by his own shoulder, he must raise himself higher on this shoulder than the other; and he must bring the arm of the suspended patient as quickly as possible to his own breast. In this position he should shake the patient when he raises him up, in order that the rest of the body may be a counterpoise to the arm which is thus held. But if the patient be very light, a light child should be suspended behind along with him. These methods of reduction are all of easy application in the pulena, as they can all be performed without instruments, but they may also be used elsewhere.

5. Those who accomplish the reduction by forcibly bending it outward nor inward; and yet I do not positively pretend that dislocation is wry apt to occur forward, and they are more particularly deceived in those persons who have the fleshly parts about the joint and arm much constricted; for, in all such cases, the head of the arm appears to protrude forward. And I in one case of this kind having said that there was no dislocation, exposed myself to censure from certain physicians and common people on that account; for they fancied that I alone was ignorant of what everybody else was acquainted with, and I could not convince them but with difficulty, that the matter was so. But if one will strip the point of the shoulder of its fleshly parts, and where the muscle (deltidium) extents, and also lay bare the tendon that goes from the armpit and clavicle to the breast (pectoral muscle), the head of the humerus will appear to protrude strongly forward, although not dislocated, for the head of the humerus naturally inclines forward, but the rest of the bone is turned outward. The humerus is connected with the breast by the cavity of the axilla, when the arm is stretched along the sides; but when the whole arm is stretched forward, then the head of the humerus is in a line with the cavity of the humerus, and no longer appears to protrude forward. And with regard to the variety we are now treating of, I have not seen a case of dislocation forward.

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Chapter 5

Introduction
This chapter outlines the history of reduction techniques of anterior shoulder dislocations. Many articles have been published on reduction techniques of anterior shoulder dislocations in past centuries. The Edwin Smith Papyrus, written around 1600 BC, is probably the oldest paper known in which the ancient Egyptians indicate that they were well versed in the treatment of fractures and dislocations of the shoulder. The most famous description of how to reduce a shoulder dislocation stems from “the father of medicine” Hippocrates (460-377 BC). In his work “On the Articulations”, which was translated by Francis Adams and published in “The Genuine works of Hippocrates” in 1939, Hippocrates describes in detail the various reduction methods available for shoulder dislocations all based upon traction of the injured arm.

He further proposes modifications of his own technique. The only modifications to Hippocrates original technique were the methods in which counter traction was applied. He used hands, a shoulder, a ladder, a long stick, or even a chair as fulcrum instead of a foot in the axilla. In addition, his treatment of recurrent shoulder instability by applying a hot iron through the inferior portion of the axilla is well-known. In order to reduce shoulder dislocations adequately, he stated: “reduction is to be effected, if possible immediately while still warm, otherwise as quickly as it can be done, for reduction will be a much quicker and easier process for the operator and a much less painful one to the patients, if effected before swelling comes on.” Hippocrates methods have been used throughout the centuries and still survive in various forms to this day.

According to William Brockbank many books on surgery of the sixteenth and seventeenth century include important and well-illustrated sections on dislocations. The French surgeon Ambroise Paré (1510-1590), whose collected works were published in Paris in 1575, has written the standard medieval treatise on surgery of injuries. Most of his techniques were based on the principles of Hippocrates. The ladder method has been described in detail. Since Paré’s time other traction methods with the arm in slight abduction have been advocated. In addition, the different traction methods are depicted in historical pictures in old German books relating to this particular period. Many medieval devices have been described that were used as aids to facilitate shoulder reductions. In 1517, Hans von Gersdorff (1455-1517) wrote his “Feldbuch der Wund-Arztney”. In this he describes screw traction for the reduction of shoulder dislocations and a combination of metal splints, screws, and turnbuckles to stretch out flexion contractures of joints. (Figure 1)

Nineteenth-century surgeons still had not determine which method of reduction was most likely associated with minimal trauma. In their view, the old reduction methods caused severe trauma, subsequently resulting in irreversible damage of the joint tissues.
In 1870 Theodorus Kocher of Berne proposed his method of reduction. It was initially employed by himself to reduce long-standing shoulder dislocations. For many years the “Kocher manoeuvre” remained the standard teaching. However, during and after the First World War, some surgeons questioned its value and consequently traction-counter-traction methods regained popularity.
Lewis Stimson of New York (1900) described the hanging arm method or gravity reduction technique. According to this technique, the patient lies prone on a canvas stretcher with his arm hanging through a hole in the canvas. A sandbag of 10 lbs. was applied to the wrist of the injured arm and reduction subsequently occurs due to muscle relaxation.

From the above we can conclude that anterior shoulder dislocation may be reduced by several methods. The three most popular techniques are named after the mentioned surgeons, namely Hippocrates, Kocher and Stimson. Various and apparently new techniques have been described for reduction of AFASD. Some of them are genuinely new, whereas others are merely a modification of older techniques. Most authors agree that early treatment of first-time anterior dislocation of the shoulder is the key to success. Each of the manoeuvres has its own success rates and complications.

In 1991, Riebel and McCabe made a classification of reduction methods. They divided the methods of reduction of AFASD into four basic methods: the traction method, the leverage method, the scapular manipulation method, and a combination of these three. Similar classification was used in an article by Mattick and Wyatt. In accordance with the two above mentioned articles this described classification of reduction methods will be further discussed.

**Reduction techniques**

*Traction*

The basic principle of the traction technique is to gradually overcome muscle spasm of the shoulder girdle. Essential to this method is that the patient is able to relax his muscles as much as possible. Sometimes this can only be achieved by administering some form of sedation or analgesics. Of all the categories, the group of traction methods is considered to be the most popular.
Riebel and Mattick both subdivided this group in relation to the position of the arm while traction is applied.\textsuperscript{23,34} This results in four subcategories, which are: abduction, lateral and forward flexion, and overhead traction. These subcategories will be discussed respectively. Hippocrates first described traction techniques with the arm in abduction.\textsuperscript{1} The Hippocratic manoeuvre we still use today involves the foot of the physician placed in the axilla to perform counter traction.

"The patient must lie supine. The physician stands on the affected side. He holds the upper extremity with both hands, pulls it towards his side and by using his heel in the axilla; he counterpushes the head of the humerus, which will reduce. Traction should be gentle and slow. The arm can be gently rotated to unlock the head".

As mentioned earlier in this chapter, Hippocrates has also described modifications of this method. All his methods are based upon traction of the injured arm. In the past century, several articles have been published on the use of traction with the arm in abduction. Nicola used a fist in the axilla as a fulcrum.\textsuperscript{28}

Noordeen et al. described a method in which the patient is seated on a chair, facing the backrest with the affected arm hanging over it.\textsuperscript{29} The wrist is held down firmly by the physician and the patient is asked to stand up when the muscles are fully relaxed. Reduction occurred in 72 percent of the patients who were treated this way and it represents an effective method which does not require sedation.

Westin et al. also seated their patients.\textsuperscript{41} They placed a cast stockinette around the affected proximal forearm with the elbow in 90° flexion. An assistant helped the patient to sit up straight by putting both his hands in the axilla against the chest wall on the affected side. The physician placed his foot in the stockinette to apply maximum traction, supporting the wrist. Using this manoeuvre reduction occurred in 97 percent. This method was referred to as the Snowbird technique.

Another traction method with a seated patient was described by Kuah.\textsuperscript{18} Once seated on the chair, the patient was told to slump from the waist. The assistant, who stands behind the chair, supported the full upper body weight. When the patient was fully relaxed, the physician began to apply longitudinal traction until reduction occurs.
Since the early days, many devices have been designed to facilitate reduction more easily because most reduction methods with the arm held in abduction require great effort by the physician. Recently, Boger described the use of padded strapping around the supine patient’s flexed elbow and then around the physician’s waist. Hereby, the physician can use his body-weight to apply traction. A similar method was presented by Waldron.

In an article by Poulsen, who served as a medical officer in Greenland, a traction technique is described with the arm held in lateral position. He observed this method being used by the Eskimos in Greenland. Hence, he called this the “Eskimo” technique.

According to Poulsen the “Eskimo” technique is extremely simple and does not require additional instruments. Furthermore non-medical personnel may use this method at the site of the accident as well as in the emergency department.

Although presented as a new technique by Poulsen, Stimson had already described a same method, in which the patient was lifted from the ground by pulling his dislocated arm, after he was placed on his unaffected side.

The third traction technique, forward flexion, is still a popular method. In the original article by Stimson, the patient is placed in prone position, with the arm through a hole in the cot and a 10 lb. sandbag attached to the wrist. After waiting a few minutes, it was found that reduction had occurred and no analgesia was needed.
Shackelford described a modification of the Stimson technique. Instead of using a weight to achieve reductions, he attached the affected arm of the patient to the frame of a hydraulic stretcher and elevated the stretcher until reduction had occurred.

Another modification of the forward flexion traction method was described by Pick and later by Lippert. They both flexed the patient’s elbow to 90° while traction was applied in a prone position. A quite similar modification with the elbow flexed was described by Waldron, however in this instance the patient is in a supine position.

In the literature two methods of self-reduction have been described which resemble the forward flexion method. Aronen described a technique, especially for athletes, in which the fingers are locked in front of the ipsilateral knee of the dislocated shoulder, while the patient is seated on the ground. Leaning backwards and extending the hip and thus applying traction causes reduction. Boss, Holzach, and Matter described a similar method, only in this instance the patient had to push the shoulders in anterior direction, creating rotational movement in the scapula.
The last method in the traction group is the overhead traction technique. Initially, Sir Astley Cooper outlined this technique in 1825. Cooper observed that in full elevation, reduction was easily performed because in this position the muscles of opposition are relaxed hereby offering no resistance to reduction. This position was later defined as the "zero position" by Saha.

In 1938, Milch reintroduced this technique and to the present day, his name is still associated with this technique. The patient lies in the supine position while the surgeon stands on the side of the dislocation. The surgeon's arm gently abducts the affected arm to the overhead position. During this manoeuvre, the humeral head is supported. As the arm is abducted, it is gently externally rotated to release the twisted capsule. With the arm in full abduction, the humeral head can be gently pushed over the rim of the glenoid using the thumb to reduce the dislocation. Janecki and Shahcheragh described a similar method, calling it the forward elevation manoeuvre. Lacey and Crawford report a modification of the Milch technique. They found the technique easier to perform with the patient prone and the elbow flexed to 90°.

Another study using a modification of the Milch technique is described by Canales Cortes et al. They achieved reduction while bringing the affected arm in overhead position using increased traction with the elbow in 90° flexion and external rotation. The authors state that their method is much more physiological and less traumatic. Garnavos modified Milch's technique on five points in his article in 1992, making the reduction easier and less painful, and thus decreasing the need for drug administration. In the variation of McNair, the patient is placed prone with the arm hanging vertically. After 10 minutes of relaxation and downward traction, external rotation and abduction are applied. Reduction is achieved by lifting the humeral head upward and outward over the glenoid rim.

Leverage
The second major reduction technique is the leverage method. The most popular leverage method we know is the "Kocher manoeuvre". Kocher has always maintained that he was the first to describe this technique. However, Hussein states that the ancient Egyptians already used the so-called "Kocher's method", as proven by an old wall painting found in the tomb of Ramses II.
In 1870, Kocher described the technique in his original article: "Pressing the arm, with the elbow flexed, close to the side of the body, outward rotation until a resistance is encountered, elevation forward of the externally rotated arm in the sagittal plane as far as it will go, and finally slow inward rotation". In his original article he does not mention the use of traction.

![Figure 9: The Kocher manoeuvre](image)

In an article by Nash, Kocher's method is reviewed. The outcome of his literature study reveals that many authors reject this method but do advise modifications of Kocher's reduction technique. One of the modifications involves the application of traction as described by Watson-Jones. De Palma et al. mentioned another modification using constant traction along the humeral shaft only with the arm held in slight abduction.

Liedelmeyer described another leverage technique, which is in fact the first step of the technique as described by Kocher. This technique requires appropriate patient and physician position before the initiation of external rotation. The patient is positioned supine with the affected arm adducted to the patient's side. The elbow is flexed at a right angle to the humerus. Maintenance of this position is comfortable to both patient and physician. The forearm is supported by gently grasping the wrist with one hand and the elbow with the other hand. External rotation of the humerus then ensues. Using the grasped wrist as a guide, the humerus is externally rotated by allowing the forearm to "fall" under its own weight. The application of any additional external or rotational force at the wrist is avoided. Holding the hand at the patient's elbow is primarily aimed at preventing abduction. This procedure is so gentle and painless that physician and patient often do not hear or feel the reduction. External rotation then continues until the forearm lies near the coronal plane and manoeuvre is complete.
Chapter 5

Scapular manipulation
The third reduction technique differs mainly from the previous two in that the focus of the reduction is on repositioning the glenoid rather than the humeral head.

Bosley and Miles presented the technique of scapular manipulation in 1979 and later it was propagated by Anderson et al. According to this technique the patient is placed prone on the examination table with the shoulder in a position of 90° forward flexion and external rotation. The forearm is suspended from the table and traction is maintained by means of a weight for a variable period until the patient begins to relax. The surgeon then pushes the inferior tip of the scapula medially and inferiorly, while simultaneously fixing the superior and medial aspect of the scapula. This causes the scapula to pivot and reduction can thus be achieved. This technique is based on the fact that because of the dislocated humeral head, the neck of the scapula is raised and displaced medially, which leaves the inferior tip of the scapula in an abducted position. Theoretically, this technique has the advantage of being relatively atraumatic as well as quick and easy to perform. Modifications were designed using a supine and a seated position in order to decrease the patient's discomfort in the prone position with scapular manipulation.

Combination techniques
This combination group consists of methods, which combine various parts of the previously mentioned techniques.

Manes described a technique in which the surgeon stands behind the patient and inserts his flexed forearm into the axilla of the affected shoulder. His free hand is placed on the flexed forearm of the patient and gentle traction is applied. The surgeon's forearm pulls in a proximal and lateral direction and levers the head of the humerus into the glenoid.

Bahn and Mehara turned the patients on their unaffected side and applied traction perpendicular to the humeral shaft by gripping the affected arm with both hands. Accordingly, the weight of the body is used as counter traction and reduction is effected.

In an article by Yuen and Tung the use of the Spaso technique is described in a case of bilateral shoulder dislocation. Here vertical traction and external rotation is applied to the forward flexed arm in a patient who is in the supine position.

Finally, Parisien combined leverage and direct pressure to reduce shoulder dislocation. He slowly externally rotates the humerus with and without traction while the patient leans with much of his weight on the backrest of a chair with the proximal part of the dislocated arm.
Discussion
Owing to the fact that the glenohumeral joint is the most common joint to dislocate, many reduction techniques have been described in the past centuries. Some have been forgotten, but others are still used in modern emergency medicine. In this chapter a historical review was given whereby reduction techniques were categorised into four major groups, namely traction, leverage, scapular manipulation, and combinations of these three. The reason why a physician chooses a particular method is often based on personal preference and experience with a preferred method. The best treatment method is considered the one that is highly effective, quick, safe, with minimal use of analgesic or muscle relaxants and which needs little assistance. Until now, documentation on the efficacy, safety, speed, and complications of the different techniques has been studied separately. It is still not clear which reduction technique is the best treatment method for particular patient categories and it might prove useful to compare different reduction techniques in prospective clinical studies in the future. For further reading on this subject, we refer to our systemic review on reduction techniques of acute first-time anterior shoulder dislocations in chapter 6.
References


