

## Original Article

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# The Noergaard technique is a non-traumatic method for reduction of anterior shoulder dislocation

Nikolaj Erin-Madsen<sup>1</sup>, Ilija Ban<sup>2</sup>, Morten Grove Thomsen<sup>2</sup>, Jens Noergaard<sup>3</sup> & Peter Toft Tengberg<sup>2</sup>

1) Department of Orthopaedic Surgery, Copenhagen University Hospital – Herlev Hospital, 2) Department of Orthopaedic Surgery, Copenhagen University Hospital – Hvidovre Hospital, 3) Department of Orthopaedic Surgery, Copenhagen University Hospital – North Zealand Hospital, Hilleroed, Denmark

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### ABSTRACT

**INTRODUCTION:** In this article, we describe the Noergaard technique for reduction of anterior shoulder dislocation. This is an atraumatic reduction method proven successful through several years of practice. We describe and evaluate the results of this technique through a retrospective analysis of patients admitted and treated for anterior shoulder dislocation at the emergency department (ED) of Hvidovre Hospital, Denmark, in a one-year period.

**METHODS:** We reviewed the charts of all patients admitted with anterior shoulder dislocation (n = 151) at the ED. In the Noergaard technique, the patient is placed standing, bent over forwards in front of the rail on a hospital bed, resting the forehead on the back of the non-affected forearm, which is placed on the rail. The affected arm should now be relaxed and stretched, hanging straight down towards the floor. The patient is then instructed to relax as much as possible and make pendular and circular motions with the affected arm hanging down.

**RESULTS:** Reduction was primarily attempted in 67 patients using the Noergaard technique. Successful reduction was achieved in a total of 52 patients (77%).

**CONCLUSIONS:** The Noergaard technique seems to be a safe and atraumatic reduction technique that involves no physical manipulation of the affected limb. Based on our results and experience, we recommend the use of this technique as first line of treatment in anterior shoulder dislocations.

**FUNDING:** none.

**TRIAL REGISTRATION:** The study was registered with [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (NCT03649373).

Anterior shoulder dislocation is the most common large joint dislocation encountered in the emergency department (ED) [1]. With the increasing activity level of modern society, the incidence seems to be increasing with a recently reported incidence of 24 per 100,000 person years [2]. Anterior shoulder dislocation is more common in males, and the distribution is bimodal with peaks at the ages of 10-20 years and of 50-60 years [3, 4]. Several techniques for reduction have been described in both ancient and modern literature [5]. Two of the most commonly used methods are the Hippocratic and the Kocher's techniques [6, 7]. Both techniques are considered traumatic as the practitioner uses traction to the affected arm, and complications with injury of the brachial plexus and haematoma due to injury of the brachial vein have been described [8, 9]. Another technique that is

considered less traumatic is the Stimson's technique. In this position, the patient lies prone on a stretcher with weights attached to the affected arm, which hangs from the side of the stretcher. Reduction occurs when muscle spasm relaxes enough to allow the humeral head to reduce without any manipulation by the physician [10].

In this article, we describe the Noergaard technique for reduction of anterior shoulder dislocations. This is an atraumatic reduction method that has proven successful through several years of practice in the ED at Hvidovre Hospital, Denmark, with a catchment area of about 600,000 persons.

A recent epidemiological analysis demonstrates a previously unreported burden of shoulder dislocations in older age groups [11]. The patients' age and physical presentation seem to be important factors when choosing the optimal reduction technique to avoid complications like osteoporotic fracture, neurovascular injury, etc.

Dr. Noergaard invented the technique when he experienced an anterior shoulder dislocation while water skiing on deep water. He was located vertically in the water with the affected arm lying horizontally in the surface of the water and he reduced his shoulder through the combination of pendular movements and muscle relaxation. He further developed the technique for use in patients with anterior shoulder dislocation.

The aim of this study was to describe and evaluate the results of the Noergaard technique by retrospective analysis of patients admitted with and treated for anterior shoulder dislocation at the ED of Hvidovre Hospital in a one-year period.

## METHODS

We retrospectively reviewed the charts of all patients admitted with shoulder dislocation at the ED at Hvidovre Hospital between 1 January 2014 and 31 December 2014.

A search was made in the local database and a total of 151 patient' charts were reviewed. In total, 108 were men with an average age of 39.8 years (range: 15-93 years) and 43 women with an average age of 56.3 years (range: 18-94 years).

Patients were received in the ED and examined by a nurse or doctor. If clinical signs of dislocation appeared, the patient was directly instructed to position for the Noergaard technique and reduction was carried out without previous X-rays.

### The Noergaard technique

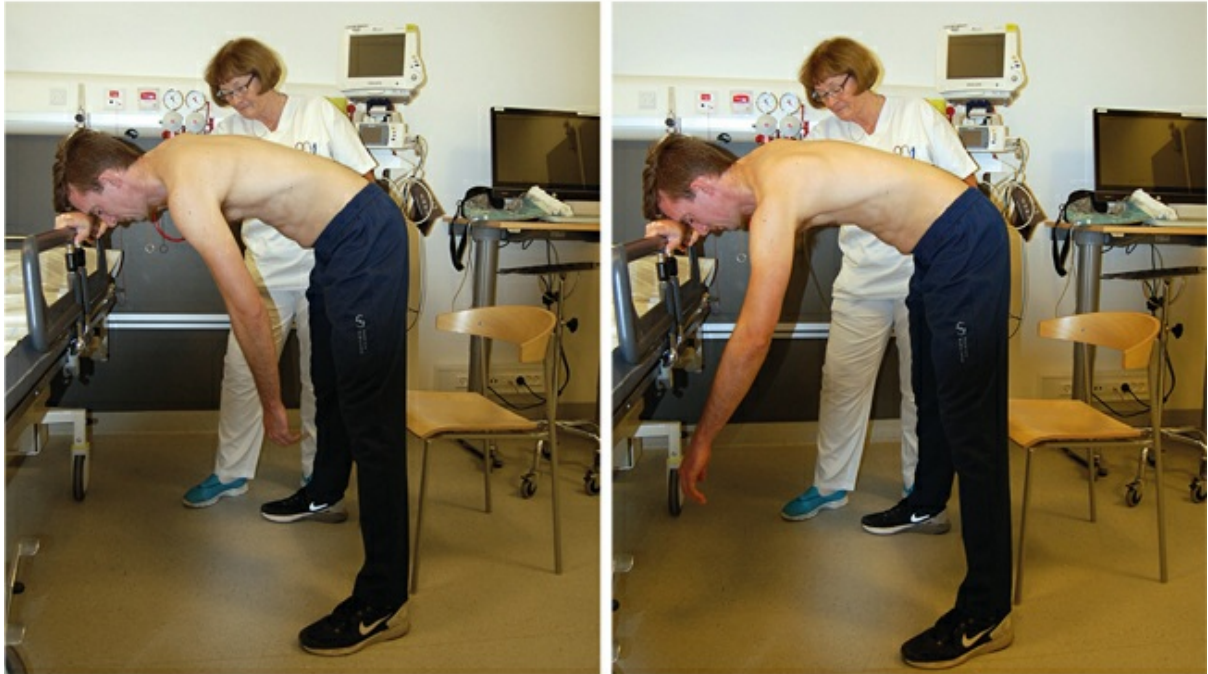
The Noergaard technique is used for anterior dislocation only. The patient must be able to stand upright on both legs during the procedure. Following clinical examination of the shoulder and the likely diagnosis of an anterior shoulder dislocation, the patient is placed standing in an upright position in front of the rail on a hospital bed. Legs should be comfortably stretched in a wide, well-balanced stance. A chair is placed behind the patient.

The patient is then instructed to bend forwards, resting the forehead on the back of the non-affected forearm, which is placed on the rail. The patient's back should be as close to horizontal as possible. The affected arm should be relaxed and stretched, hanging straight down towards the floor (**Figure 1**). The patient is then instructed to relax as much as possible and make pendular and circular motions with the affected arm hanging down (**Figure 2**).

**FIGURE 1** The Noergaard technique. A patient with left-sided anterior shoulder dislocation.



**FIGURE 2** The Noergaard technique. A patient starting to make pendular and circular motions with the affected arm.



As the technique is based primarily on patient instruction, the reduction is done without any traumatic pulling or other manipulation of the shoulder. If the patient is in pain, anaesthetics can be administered ranging from oral ibuprofen, paracetamol or benzodiazepines to a single intramuscular injection of morphine. Anaesthetics, however, are not recommended to prevent drug-induced dizziness.

Successful reduction occurs when sufficient muscle relaxation allows the scapula to slide laterally, allowing the humeral head to reposition to its natural location in the glenoid fossa. Often, the patient will experience a popping sensation and immediate relief of pain when the shoulder is reduced.

The technique should be attempted between 15 and 30 minutes before switching to a different reduction technique or before admitting the patient to the operating theatre for procedural sedation and reduction. If reduction does not occur, we recommend applying gentle external rotation and a light longitudinal pull to the wrist of the affected arm before switching to a different, more traumatic technique. This is not part of the Noergaard technique as it is considered traumatic, but it has proven successful if the patient has reached sufficient muscular relaxation. This should be used only if the patient is simultaneously able to voluntarily and muscularly relax throughout the reduction attempt.

Two-plane radiographs to confirm reposition and to diagnose any concomitant fracture are obtained after reduction. A clinical examination is carried out after reduction by a doctor to check for neurological damage or vascular injury.

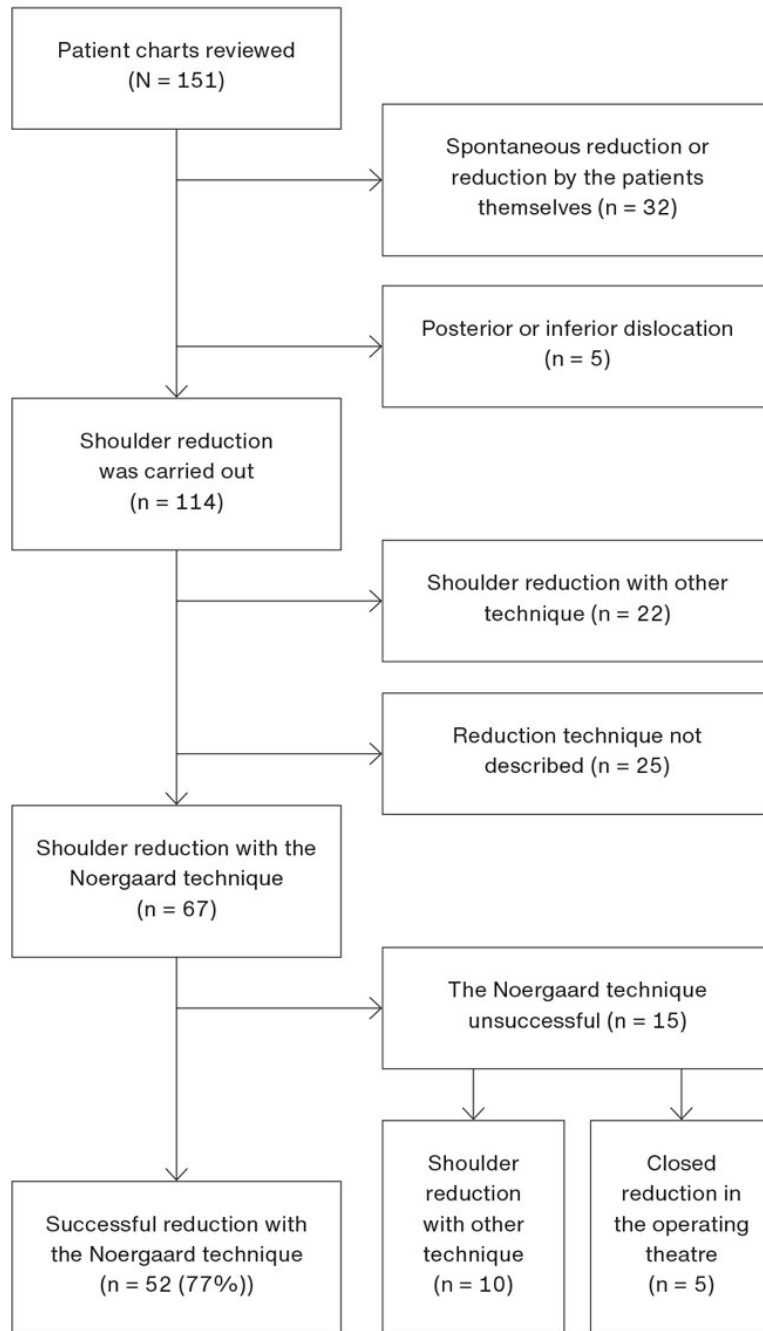
After reduction is confirmed radiographically, the shoulder is immobilised in a comfortable position of internal rotation, using a shoulder sling and swathe for at least five days or as long as pain persists [12]. All patients are referred to an orthopaedic outpatient clinic for stability evaluation 2-3 weeks after reduction.

*Trial registration:* This study was registered with [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (NCT03649373).

## RESULTS

The Noergaard technique was attempted in 67 patients out of 114 anterior dislocations. It was successful in 52 patients. Spontaneous reduction or reduction by the patients themselves prior to clinical examination was experienced for 32 patients. Another five were diagnosed with either a posterior or inferior dislocation. Among the remaining 114 anterior dislocations, the reduction was primarily attempted in 67 patients by means of the Noergaard technique, 22 patients had their shoulder reduced by a different reduction technique and the reduction technique was not described in 25 patients. Successful reduction was achieved in a total of 52 patients by the Noergaard technique. In ten patients in whom the Noergaard technique was unsuccessful, the shoulder was reduced by means of a different technique in the ED and another five patients were admitted for closed shoulder reduction under general anaesthesia in the operating theatre (**Figure 3**). Among the 52 patients reduced by the Noergaard technique, 41 were men (78.8%) with an average age of 40.6 years (range: 17-76 years) and 11 were women with an average age of 60 years (range: 36-86 years). A total of 20 patients (38.4%) had experienced a dislocation in the same shoulder earlier (**Table 1**). Among the 67 patients in whom the Noergaard technique was the primary choice, 34 received anaesthetics before reduction was attempted. Anaesthetics were administered either orally with paracetamol, ibuprofen or both (n = 10) or intravenously with low-dose morphine (n = 13). Nine patients received low-dose benzodiazepine only and two patients received both low-dose morphine and benzodiazepine intravenously.

**FIGURE 3** Flow chart of treatment algorithm.



**TABLE 1** Patients with successful reduction by the Noergaard technique (N = 52).

	n (%)
<i>Gender</i>	
Men	41 (78.8)
Women	11 (11.2)
<i>Dislocations</i>	
Primary	32 (61.5)
Habitual: > 1	20 (38.5)

X-rays were taken and analysed shortly after reduction by a doctor. Two patients had a bony Bankart lesion and another two patients had a tuberculum majus fracture. One patient was diagnosed with a Hill Sachs lesion and one patient had a concomitant dislocation of the acromioclavicular joint. All fractures and dislocations were treated conservatively. No patients were diagnosed with neurovascular damage.

**DISCUSSION**

Dislocations of the shoulder should be tended to promptly using the easiest and least traumatic reduction technique available. Our results show a 77% success rate when using the Noergaard technique.

High success rates (68-100%) have been reported for many of the traditional reduction techniques [5], and more than twenty different techniques have been described [6]. Traditional techniques with manipulation require an experienced physician because these techniques are more traumatic and may cause additional injuries to the shoulder, such as fractures [13]. The Noergaard technique addresses this problem as it is easy to perform and teach and can be performed by experienced ED nurses giving verbal instructions to the patient. If the Noergaard technique fails, then other more traditional techniques can always be utilised. This, in a sense, makes the technique a “free shot” at reduction, without any risk of associated injuries. Few patients who underwent shoulder reduction with the Noergaard technique were diagnosed with fractures, and it is our impression that none of these fractures were caused by the reduction technique.

As the Noergaard technique depends on the patient’s ability to cooperate and relax the shoulder muscles, it is the authors’ impression that sufficient patient compliance is a crucial factor for successful reduction. Therefore, multi-traumatised patients, elderly patients experiencing fatigue and patients who are unable to stand due to concomitant disorders should not undergo reduction with this technique. If high-dose anaesthetics are indicated, a different technique should also be used to prevent drug-induced dizziness.

One limitation of this study is its retrospective design with patient charts being reviewed and the lack of follow-up to establish any long-term complications. Another limitation is that although 114 patients were diagnosed with anterior shoulder dislocation, the Noergaard technique was primarily attempted in only 67 patients according to patient charts. This is a result of insufficient record keeping and the fact that orthopaedic surgeons

from other hospitals regularly work in the ED at Hvidovre Hospital as substitutes. Therefore, a different technique may have been preferred as first choice.

## CONCLUSIONS

The Noergaard technique seems a safe reduction technique; it is atraumatic and does not involve physical manipulation of the affected limb. Based on our results and experience, we recommend the use of this technique as first line of treatment in anterior shoulder dislocations.

**Correspondence** *Nikolaj Erin-Madsen*. E-mail: [nikolajerin-madsen@hotmail.com](mailto:nikolajerin-madsen@hotmail.com)

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