A Survey of Emergency Providers Regarding the Current Management of Anterior Shoulder Dislocations

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Abstract

Background: Anterior shoulder dislocations (ASDs) are frequent painful injuries commonly treated in the emergency department. The last decade new potentially less traumatic and painful reduction techniques for ASDs have been introduced. Recent literature comparing best reduction techniques, medication use, and approaches is limited. To better guide future research including the use of these newer techniques, information about the current use of different reduction techniques and medication is needed. Methods: Our primary aim was to survey the techniques used by emergency practitioners to reduce ASDs. Our secondary objective was to gather data on medication usage during reduction. To these ends, we surveyed members of the Netherlands Society of Emergency Physicians. Results: Forty-four percent of respondents reported using a traction-based technique (Hippocrates or Stimson). Biomechanical techniques were used by 40% of respondents. Twelve percent reported using the Kocher leverage-based technique. Five percent of the techniques used could not be classified. A wide variety of procedural sedation and pain management interventions were reported, with an opioid and propofol being used most commonly. Approximately 9% of the reductions were attempted without any medications. Conclusions: To our knowledge, this is the first study of its kind on ASD management by emergency practitioners. Our results indicate that Dutch emergency practitioners employ all three classes of reduction techniques: traction-countertraction most commonly, closely followed by biomechanical techniques. Medication use during repositioning varied widely. Per our survey, emergency practitioners are desirous of an evidence-based guideline for ASD management.

Keywords: Anterior shoulder dislocation, biomechanical reduction techniques, emergency department, glenohumeral dislocation

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Methods:
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Conclusions:
To our knowledge, this is the first study of its kind on ASD management by emergency practitioners. Our results indicate that Dutch emergency practitioners employ all three classes of reduction techniques: traction-countertraction most commonly, closely followed by biomechanical techniques. Medication use during repositioning varied widely. Per our survey, emergency practitioners are desirous of an evidence-based guideline for ASD management.
questionnaire was sent to 587 individual members and contained nine questions in Dutch covering: techniques used, shoulder reduction experience, medications used, and the perceived need for an evidence-based ASD management guideline [Figure 1 for full questionnaire, translated into English]. IP addresses are automatically logged in Survey Monkey®. Questions could not be left unanswered without a reason, and the questionnaire could not be submitted if any question remained unanswered. All open-ended responses were reviewed by two of the authors (conception and study design, coordinator of project, coordination, and writing of manuscript) to check the spelling of the techniques or match a description with a technique. If there was no consensus or the technique was not known and could not be found in the literature, it was cataloged as “others.” Results were analyzed with IBM SPSS Statistics for Windows, Version 21.0. Released 2012; (Armonk, NY, USA: IBM Corp.), released 2012. We used frequency tables for the techniques and medications used. We did cross tables for experience compared to medication, experience compared to education, and interest in an EBM guideline compared to experience. Because this study surveyed physicians, no ethical approval was needed per Dutch law.

RESULTS

Respondents numbered 158–112 EPs (71%) and 46 EMRs (29%). Nearly two-thirds of the respondents claimed to have reduced >50 ASDs.

In first reduction attempts, traction-based techniques (Hippocrates 25.3%, Stimson 18.4%) predominated slightly at 43.7%. Biomechanical repositioning techniques were used first by 39.2% of the respondents (Cunningham 23.4%, Milch 11.4%, and scapular manipulation 4.4%). These techniques depend on muscular relaxation without the application of force and include the Cunningham, modified Milch, scapular manipulation, and the FARES technique. Kocher’s leverage technique was used by 12.0%, and 5.1% of techniques could not be classified [Table 1]. Table 2 lists the second techniques used if a first reduction attempt failed. In this circumstance, emergency practitioners used traction-based techniques 39.9% of the time, biomechanical techniques 32.4% of the time, and leverage techniques 19% of the time. A second technique was omitted in 4.4% of surveys, and 4.4% of the techniques used were not specified. We did comparisons between EP and EMR practice patterns, but these differences were not statistically significant.

Twenty-three percent of respondents reported a >95% first-attempt success rate. Approximately 80% of all practitioners indicated a >75% first-attempt success rate. Table 3 lists medications used to facilitate reduction. Multiple answers were allowed (e.g. morphine and propofol). Nearly 9% of respondents indicated no medication usage. An opioid (e.g., fentanyl or morphine) was the most commonly used analgesic and propofol the most commonly used sedative.

Forty-four percent of respondents indicated that their hospital had an ASD reduction protocol. Physician awareness of protocol existence did not significantly affect choice of reduction method.

Seventy-four percent of respondents indicated that an evidence-based ASD guideline would be helpful [Table 4]. This interest was most pronounced in the least-experienced physicians.

1. What is your function?
   - Emergency physician
   - Resident emergency medicine
   - Other

2. Experience in repositioning anterior shoulder dislocation?
   - <10
   - 10–50
   - 50–100
   - >100

3. Is there a protocol in your hospital for the repositioning of anterior shoulder dislocation?
   - Yes
   - No

4. Preferred first technique used in the repositioning of anterior shoulder dislocation?
   - Free text

5. Preferred second technique used in the repositioning of anterior shoulder dislocation?
   - Free text

6. Medication commonly used in the repositioning of anterior shoulder dislocation?
   - None
   - Nonsteroidal anti-inflammatory drugs (NSAIDs)
   - Fentanyl intravenous
   - Fentanyl intranasal
   - Morphine intravenous
   - Midazolam
   - Propofol
   - Esketamine
   - Diazepam
   - Lidocaine intra-articular
   - Free text

7. Estimated first time success?
   - <50%
   - 50–75%
   - 75–95%
   - >95%

8. Did you ever encounter complications during the repositioning of an anterior shoulder dislocation?
   - Yes
   - No
   - Free text for explanation

9. Would you like to have an evidence-based guideline for the repositioning of anterior shoulder dislocation?
   - Yes
   - No

Figure 1: Questionnaire translated from Dutch
**Discussion**

To our knowledge, this is the first study of its kind on ASD management by emergency practitioners. Two earlier studies of orthopedic surgeons found that they relied heavily on traction- or leverage-based techniques.\(^6\),\(^7\) In contrast, Dutch emergency practitioners employ a wider range of techniques. Biomechanical techniques, in particular, are more likely to be used by EPs and EMRs.

Traction-based technique use does remain high among emergency practitioners, despite increased complication risk, particularly nerve damage.\(^8\),\(^9\) Furthermore, leverage techniques are not without possible adverse effects, especially humeral spiral fractures in older patients or axillary vessel rupture.\(^8\),\(^9\) Continued use of these techniques may be due to a variety of factors including the lack of literature support for one particular technique, comparable success rates with a wide variety of techniques, familiarity with traction-based techniques, and most Dutch reduction protocols including only traction-countertraction and leverage-based techniques. Furthermore, these techniques cause pain and often mandate procedural sedation and analgesia as a consequence, causing prolonged ED lengths of stay.\(^12\)-\(^14\)

Our survey results indicated high interest in an evidence-based ASD reduction guideline. Furthermore, the negative effects of traction-based technique and leverage techniques (particularly pain and the resultant need for medication with its attendant prolonged ED stay, among others) may argue for such guideline. This point is of course countered by the lack of evidence favoring the use of any one technique or series of techniques.

Although the “first attempt” was undefined in our survey, respondents reported a high first-attempt success rate. This is in keeping with other literature showing success rates in general for ASD reductions of 60%–100% regardless of approach.\(^9\)

Medication use by our respondents spanned the usual spectrum described in the present medical literature.\(^15\)-\(^22\) Surprisingly, nitrous oxide use was not reported. Furthermore, surprising was the high use of intra-articular lidocaine (27%). Our respondent’s reliance on propofol probably stems from its status as the “drug of choice” in the NSEP’s procedural sedation and analgesia guideline.

As a result of this study and the available literature, we think that randomized high-quality prospective trials are needed to provide more evidence on optimal ASD repositioning techniques. Further studies on optimal medication use for ASD

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**Table 1: First technique used for reduction**

| Technique   | Frequency (%) |
|-------------|---------------|
| Hippocratic | 40 (25.3)     |
| Cunningham  | 37 (23.4)     |
| Stimson     | 29 (18.4)     |
| Kocher      | 19 (12.0)     |
| Modified Milch | 18 (11.4) |
| Scapula Tilt | 7 (4.4)      |
| Others      | 8 (5.1)       |
| Total       | 158 (100.0)   |

**Table 2: Second technique used for reduction**

| Technique   | Frequency (%) |
|-------------|---------------|
| Hippocratic | 43 (27.2)     |
| Kocher      | 30 (19.0)     |
| Modified Milch | 20 (12.7) |
| Stimson     | 20 (12.7)     |
| Scapula Tilt | 17 (10.8)    |
| Cunningham  | 14 (8.9)      |
| No second technique | 7 (4.4) |
| Others      | 7 (4.4)       |
| Total       | 158 (100.0)   |

**Table 3: Medication used (multiple responses possible)**

| Medication              | Responses, n (%) |
|-------------------------|------------------|
| Intra-articular lidocaine | 100 (26.3)   |
| Fentanyl intravenous     | 81 (21.3)      |
| NSAID                   | 51 (13.4)      |
| Propofol                | 44 (11.6)      |
| None                    | 34 (8.9)       |
| Fentanyl nasal          | 29 (7.6)       |
| Midazolam               | 18 (4.7)       |
| esketamine              | 13 (3.4)       |
| Morphine intravenous    | 9 (2.4)        |
| Diazepam                | 1 (0.3)        |
| Total                   | 380 (100.0)    |

NSAID: Nonsteroidal anti-inflammatory drugs

**Table 4: Interest for guideline compared to number of reductions performed**

| Number of reductions performed | EBM guideline wanted | Total |
|--------------------------------|----------------------|-------|
| <10                            | Yes                  | No    |
| Number of responses            | 7                    | 0     | 7     |
| Percentage of group            | 100.0                | 0.0   | 100.0 |
| 10-50                          |                      |       |
| Number of responses            | 36                   | 11    | 47    |
| Percentage of group            | 76.6                 | 23.4  | 100.0 |
| 50-100                         |                      |       |
| Number of responses            | 46                   | 9     | 55    |
| Percentage of group            | 83.6                 | 16.4  | 100.0 |
| >100                           |                      |       |
| Number of responses            | 24                   | 20    | 44    |
| Percentage of group            | 54.5                 | 45.5  | 100.0 |
| Total                          |                      |       |
| Number of responses            | 113                  | 40    | 153   |
| Percentage of total            | 73.9                 | 26.1  | 100.0 |

EBM: Evidence-based medicine
reductions are needed as well. Taken together, these new bodies of knowledge could form the basis for an evidence-based ASD management guideline since there is substantial interest in such guidance.

A randomized trial covering all ASD reduction techniques would be logistically impossible due to the wide range of techniques available. However, narrowing study focus to the commonly used biomechanical techniques with their more favorable adverse-effect profile could be both fruitful and feasible. We are tantalized by our experience that suggests a high repositioning success rate, a better patient experience, less medication use, and a shorter ED length of stay with biomechanical technique reduction use.

**Limitations**

Our survey is hampered by its reliance on practitioner memory and self-report. Because no supporting documentation is demanded for survey answers, it is possible that answers to key survey questions are incorrect. In addition, the direction and magnitude of this possible “incorrectness” are impossible for us to ascertain.

No cookies were used to identify unique users, and the link was not password protected. However, because a limited group received the E-mail, no incentive was included, and the survey was voluntary, it would be highly unlikely that the same person repeatedly completed a questionnaire or shared the questionnaire with others to complete. We did check to see if any IP address had unusually high returns but did not find that occurrence. Survey Monkey® cannot report survey view rates, but we reasonably expected that if physicians opened the link, they also completed the questionnaire.

Because we did not perform a presurvey pilot, it is possible that respondents interpreted the questions differently from our intention. This misinterpretation is also possible with the description or terms that the respondents provided for the techniques they use in repositioning. There is a risk that the participants used a different term or meant a different technique. We also omitted some follow-up questions to keep the questionnaire brief, to limit survey completion time, and to attempt to increase the number of respondents. As a result, the information gathered may be insufficient to capture all the details of emergency practitioner approach to ASD.

ASD management complications were rarely reported by survey respondents limiting our ability to draw conclusions about this. It is also possible that underreporting, late complications or post-ED discharge complications occurred that would not be captured by our survey.

Our relatively low survey response rate of 27% may limit our ability to draw statistically valid conclusions. However, we did receive responses from 66% of Dutch EDs, representing a continuum of teaching hospitals, academic and community hospitals, and high- and low-volume institutions. We did collect data from a broad spectrum of Dutch emergency practitioners and only completed questionnaires are included.

Furthermore, recent research shows that a low survey response rate does not necessarily directly reduce result quality.[23]

This study involved only Dutch EPs and EMRs, thus making it difficult to generalize these findings. The nature of health care in The Netherlands is comparable to that of other western countries, but it may not reflect on the practice in other health-care systems.[24]

**Conclusions**

Our survey demonstrated that Dutch EPs and EMRs most commonly use traction-countertraction techniques for ASD reduction. They also commonly use biomechanical techniques as well. Medication use to effect reduction and control pain, relief distress, and achieve muscle relaxation varies widely. ASD management guidelines are strongly desired by emergency practitioners. These three findings should help shape the direction of future ASD management research.

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**Conflicts of interest**

There are no conflicts of interest.

**References**

1. Garnavos C. Technical note: Modifications and improvements of the milch technique for the reduction of anterior dislocation of the shoulder without premedication. J Trauma 1992;32:801-3.
2. Cunningham N. A new drug free technique for reducing anterior shoulder dislocations. Emerg Med (Fremantle) 2003;15:521-4.
3. Kohli SU, Dronen SC. The scapular manipulation technique for the reduction of acute anterior shoulder dislocations. J Emerg Med 1990;8:625-8.
4. Anderson D, Zvirbulis R, Ciullo J. Scapular manipulation for reduction of anterior shoulder dislocations. Clin Orthop Relat Res 1982;(164):181-3.
5. Sayegh FE, Kenanidis EI, Papavasiliou KA, Potospis ME, Kirkos JM, Kapetanos GA, et al. Reduction of acute anterior dislocations: A prospective randomized study comparing a new technique with the hippocratic and kocher methods. J Bone Joint Surg Am 2009;91:2775-82.
6. te Slaa RL, Wijnholds MP, Marti RK. Questionnaire reveals variations in the management of acute first time shoulder dislocations in the Netherlands. Eur J Emerg Med 2003;10:58-61.
7. Berendes TD, Pilot P, Nagels J, Vorsteloo AJ, Nelissen RG. Survey on the management of acute first-time anterior shoulder dislocation amongst Dutch public hospitals. Arch Orthop Trauma Surg 2015;135:447-54.
8. Mattick A, Wyatt JP. From hippocrates to the eskimo – A history of techniques used to reduce anterior dislocation of the shoulder. J R Coll Surg Edinb 2000;45:312-6.
9. Riebel GD, McCabe JB. Anterior shoulder dislocation: A review of reduction techniques. Am J Emerg Med 1991;9:180-8.
10. Nash J. The Status of Kocher’s Method of Reducing Recent Anterior Dislocation of the Shoulder. J Bone Joint Surg 1934;16:535.
11. Kirker JR. Dislocation of the shoulder complicated by rupture of the axillary vessels. J Bone Joint Surg Br 1952;34-B: 72-3.
12. Burton JH, Bock AJ, Stout TD, Marcolini EG. Etomidate and midazolam for reduction of anterior shoulder dislocation: A randomized, controlled trial. Ann Emerg Med 2002;40:496-504.
13. Miller SL, Cleeman E, Auerbach J, Flatow EL. Comparison of intra-articular lidocaine and intravenous sedation for reduction of shoulder dislocations: A randomized, prospective study. J Bone Joint Surg Am 2002;84-A: 2135-9.

14. Fitch RW, Kuhn JE. Intraarticular lidocaine versus intravenous procedural sedation with narcotics and benzodiazepines for reduction of the dislocated shoulder: A systematic review. Acad Emerg Med 2008;15:703-8.

15. Suder PA, Mikkelsen JB, Hougaard K, Jensen PE. Reduction of traumatic secondary shoulder dislocations with lidocaine. Arch Orthop Trauma Surg 1995;114:233-6.

16. Kosnik I, Shamsa F, Raphael E, Huang R, Malachias Z, Georgiadis GM, et al. Anesthetic methods for reduction of acute shoulder dislocations: A prospective randomized study comparing intraarticular lidocaine with intravenous analgesia and sedation. Am J Emerg Med 1999;17:566-70.

17. Orlinsky M, Shon S, Chiang C, Chan L, Carter P. Comparative study of intra-articular lidocaine and intravenous meperidine/diazepam for shoulder dislocations. J Emerg Med 2002;22:241-5.

18. Blaivas M, Adhikari S, Lander L. A prospective comparison of procedural sedation and ultrasound-guided interscalene nerve block for shoulder reduction in the emergency department. Acad Emerg Med 2011;18:922-7.

19. Cheok CY, Mohamad JA, Ahmad TS. Pain relief for reduction of acute anterior shoulder dislocations: A prospective randomized study comparing intravenous sedation with intra-articular lidocaine. J Orthop Trauma 2011;25:5-10.

20. Tezel O, Kaldirim U, Bilgic S, Deniz S, Eyi YE, Ozyurek S, et al. A comparison of suprascapular nerve block and procedural sedation analgesia in shoulder dislocation reduction. Am J Emerg Med 2014;32:549-52.

21. Dunn MJ, Mitchell R, DeSouza CI, Drummond GB, Waite A. Recovery from sedation with remifentanil and propofol, compared with morphine and midazolam, for reduction in anterior shoulder dislocation. Emerg Med J 2011;28:6-10.

22. Gleeson AP, Graham CA, Meyer AD. Intra-articular lignocaine versus entonox for reduction of acute anterior shoulder dislocation. Injury 1999;30:403-5.

23. Keeter S, Miller C, Kohut A, Groves RM, Presser S. Consequences of reducing nonresponse in a national telephone survey. Public Opin Q 2000;64:125-48.

24. Health Consumer Powerhouse. Euro Health Consumer Index 2015. Health Consumer Powerhouse; 2016.