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Original Article

Clinical practice for closed reduction of distal radius fractures in Denmark

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ABSTRACT

INTRODUCTION. Distal radius fractures (DRFs) are common, with over 14,000 annual cases in Denmark. Most cases are treated non-surgically and may require closed reduction prior to casting. National guidelines for anaesthesia and reduction technique for closed reduction of DRFs are lacking, impacting clinical practices and potentially optimal care. This survey aimed to describe Danish clinical practice for initial treatment and closed reduction of DRFs.

METHODS. Between January and April 2025, the survey was distributed online to the 23 physicians responsible for all 44 emergency departments and minor injury units treating DRFs in Denmark. The survey examined the clinical practices used for anaesthesia, reduction technique and post-reduction follow-up for patients with DRFs.

RESULTS. The response rate was 100% (23/23). All departments used haematoma block as anaesthetic method. Manual reduction followed by induced muscle fatigue was reported as the preferred reduction technique (87%, 20/23). Among these, 80% (16/20) mentioned that finger-trap-traction was used as a muscle-fatiguing method. All sites used X-ray imaging to assess the reduction result. Surgery was offered when reduction was unsatisfactory, depending on various criteria, e.g. Clinical Frailty Scale, age or clinical assessment.

CONCLUSIONS. In Denmark, haematoma block is the standard anaesthetic method for the closed reduction procedure of DRFs. Mostly finger-trap traction is used to induce muscle relaxation before manual reduction. Clinical practice is generally well-aligned with minor variation in surgical intervention criteria.

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Distal radius fracture (DRF) is the second most common fracture among patients aged 65 years or older and one of the most prevalent fractures overall [1]. In Denmark, the annual incidence exceeds 14,000 fractures, corresponding to 249/100,000 inhabitants, with an increasing incidence especially among women and those aged 50-69 years [2]. Approximately two thirds of DRFs require closed reduction before casting due to fracture displacement, with the majority (76%) of all DRFs being treated non-surgically [2, 3].

A successful closed reduction may rely on adequate analgesia and proper reduction technique [4, 5]. Several methods for procedural analgesia have been described, including haematoma block, intravenous (IV) regional anaesthesia, general anaesthesia, sedation and peripheral nerve blocks (PNBs) [4, 6, 7]. Reduction may be performed by various techniques, including manual reduction or finger-trap traction, and can be preceded by muscle relaxation induced by finger-trap or manual traction [8, 9]. An insufficient closed reduction or a fracture re-displacement at follow-up may require surgery, contributing to patient discomfort and an increased socioeconomic burden, including hospital costs and temporary work incapacity [2, 10]. National guidelines from the Danish Health Authority regarding the treatment of DRFs do not provide recommendations on procedural analgesic method or closed reduction technique [11]. In Denmark, the clinical approach may instead be guided by regional or local guidelines. Thus, little is known about the clinical practice of closed reduction of DRFs in Denmark, and a wide variety of practices may exist.

This study aimed to describe current clinical practices used to treat patients with DRFs requiring closed reduction in emergency departments across Denmark.

Methods

Study design and setting

This descriptive cross-sectional survey examined the clinical practice for closed reduction of DRFs in Denmark using a survey sent to physicians responsible for emergency departments or minor injury units. In Denmark, DRFs are treated within all five regions at a total of 44 sites, either emergency departments located at a hospital (n = 28) or associated minor injury units (n = 16). The 44 sites are administered by a total of 23 divisions, as some sites belong to the same division and follow identical clinical practices.

The survey and study population

The survey comprised 26 sequential open- and closed-ended questions. In total, ten questions addressed the analgesic method used before, during and after the closed reduction. Additionally, 12 questions focused on the closed reduction procedure, the evaluation of the reduction result, follow-up and the assessment of surgical indication. Three questions characterised the respondents, and one allowed respondents to upload local guidelines (see Supplementary material for full survey). The survey was designed, conducted and reported in accordance with current survey reporting guidelines [12, 13], and was validated for content and clarity by four specialists in orthopaedic surgery (BV, PG, JA and CV).

The survey was sent to the 23 physicians managing all 44 sites performing closed reduction of DRFs in Denmark from January to April 2025. The contact information of eligible participants was obtained from official websites or through direct e-mail or phone contact. The survey was distributed via e-mail, and study data were collected using REDCap electronic data capture tools [14, 15]. The physicians were informed of the study's purpose and estimated time required to complete it (5-7 minutes) before receiving the survey. Verbal or written consent to participate was obtained before distribution. Each participant received a unique, non-transferable link to prevent multiple responses. Non-responders received up to three weekly e-mail reminders, after which they were contacted by phone and encouraged to answer the survey. All participants agreed to the publication of the results. Ethical approval was not required as no patient data were collected.

Statistical analysis

Results are presented using descriptive statistics. Counts and percentages summarise categorical variables. Non-normally distributed data, identified by visual inspection, are presented as median and IQR. Data analysis was conducted using Microsoft Excel (Microsoft Corporation) and R Core Team version 4.4.2.

Trial registration: not relevant.

Results

Study population

All 23 physicians responsible for an emergency department and/or a minor injury unit providing initial treatment of DRFs, including closed reduction, completed the survey, yielding a 100% response rate (23/23). Among the responders, 26% (6/23) worked in the Capital Region of Denmark, 26% (6/23) in the Central Denmark Region, 26% (6/23) in the Region of Southern Denmark, 17% (4/23) in Region Zealand, and 4% (1/23) in the North Denmark Region. Most were specialised in orthopaedic surgery (83%, 19/23). The remaining respondents were specialised in emergency medicine (9%, 2/23), public health medicine (4%, 1/23), and general practice (4%, 1/23).

Analgesic methods

Haematoma block was the only anaesthetic method used for the closed reduction procedure across all sites (100%, 23/23). Additionally, 22% (5/23) also used IV medications (opioids or sedation) mainly with midazolam (13%, 3/23) or remimazolam (4%, 1/23). Among the respondents, 83% (19/23) reported that resident physicians or physicians within their first postgraduate year primarily performed the haematoma block. However, most reported that the haematoma block could also be performed by specialised orthopaedic surgeons (74%, 17/23) and/or emergency physicians (44%, 10/23) (**Figure 1**). The respondents generally perceived patients sufficiently anaesthetised for closed reduction following haematoma block, either 'to a large extent' (9%, 13/23) or 'to a very large extent' (57%, 2/23). The primary analgesics used for pain management before and after closed reduction were paracetamol (87%, 20/23) and ibuprofen (74%, 17/23). Oral and/or IV opioids were reported as being used before and after closed reduction as standard by 44% (10/23) (**Figure 2**).

FIGURE 1 The level of experience of the clinicians performing the anaesthetic procedure (haematoma block) and the closed reduction of distal radius fractures. Multiple responses were permitted. Y-axis values indicate the proportion of total respondents (n = 23) as percentages, while the numbers within the columns denote the absolute respondent counts for each region.

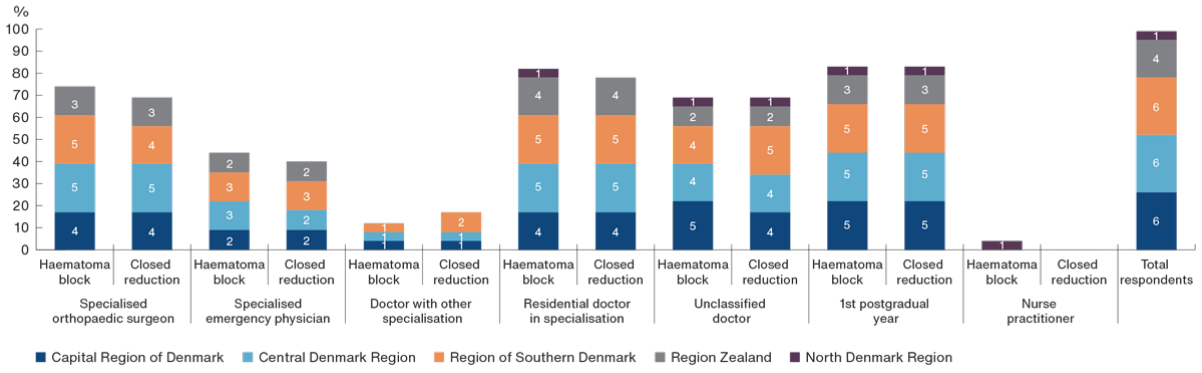
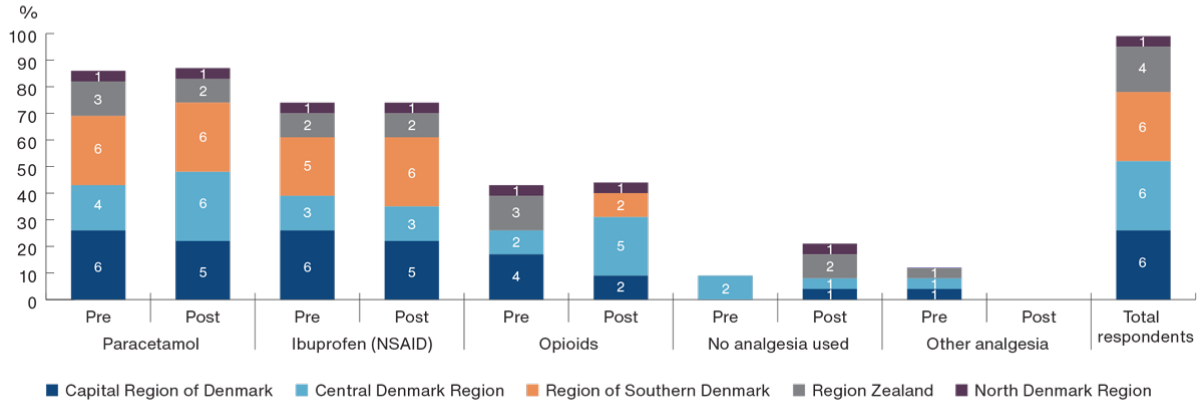


FIGURE 2 The standard analgesia administered before and after the closed reduction of the distal radius fracture. Y-axis values indicate the proportion of total respondents (n = 23) as percentages, whereas the numbers within the columns denote the absolute respondent counts for each region.



NSAID = non-steroidal anti-inflammatory drug.

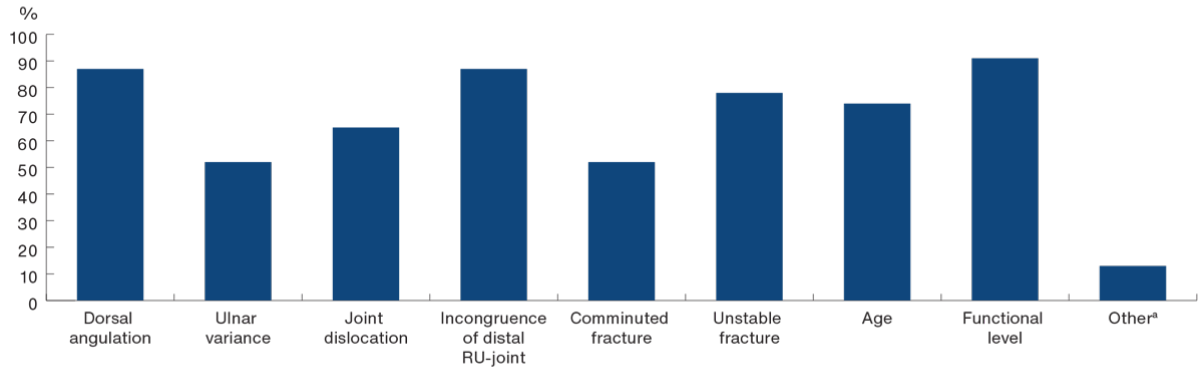
Closed reduction procedure

Manual reduction following induced muscle fatigue was reported as the standard closed reduction technique by 87% (20/23) of respondents. About half (52%, 12/23) stated that manual reduction without prior induced muscle fatigue was used either solely or as an additional reduction technique. Among those using induced muscle fatigue, 80% (16/20) used finger-trap traction, and 60% (12/20) used manual traction as a fatiguing technique. Less than half (39%, 9/23) perceived induced muscle fatigue as important. X-ray fluoroscopy was used during closed reduction by 57% (13/23), and the estimated median time from haematoma block administration to reduction was 15 minutes (range: 5-40 minutes, IQR: 10-20 minutes), with several respondents noting that timing largely depended on workload. The characteristics of physicians performing closed reduction were similar to those performing the haematoma block (Figure 1). All respondents (100%, 23/23) reported allowing a maximum of two reduction attempts to achieve a satisfactory closed reduction and the use of a dorsal forearm splint following reduction.

Follow-up and indication for surgery

All respondents reported using post-reduction X-ray imaging to assess the result of the closed reduction (100%, 23/23), which was subsequently reviewed by specialists, such as radiologists or orthopaedic surgeons, typically on the next working day. Besides being used during the closed reduction procedure, 30% (7/23) also used X-ray fluoroscopy as a supplement to X-ray imaging to evaluate the result. If the bone realignment was considered acceptable, 87% (20/23) of the responsible physicians reported that patients were scheduled for outpatient follow-up within 14 days. If the radiological result was unacceptable, surgery was generally offered based on the Clinical Frailty Scale (CFS) (39%, 9/23), age (17%, 4/23), or a combination of CFS, age and clinical assessment (43%, 10/23). All respondents reported using either national (35%, 8/23), regional (48%, 11/23) and/or local guidelines (48%, 11/23) to assess surgical indication. This assessment involved several parameters, the most common being functional level (91%, 21/23) (**Figure 3**).

FIGURE 3 Parameters used to assess the indication for surgery in patients with unacceptable bone realignment after closed reduction. Percentage (%) of the respondents agreeing to the proposed variable being a clinically applied indicator for surgery. Radiological findings were evaluated by measurement. When considered, functional level was assessed by systematically screening (e.g., Clinical Frailty Scale score) by 57% (12/21), whereas 43% (9/21) evaluated the functional level based on a clinical assessment.



RU-joint = distal radioulnar joint.
a) Included compliance and other lifestyle factors (diet, smoking, alcohol and exercise).

Discussion

This cross-sectional survey examined the clinical practices for closed reduction of DRFs in Denmark reported by physicians responsible for emergency departments and/or minor injury units. Haematoma block was the standard anaesthetic method used at all sites. Manual reduction following induced muscle fatigue was identified as the preferred reduction technique, with finger-trap traction serving as the muscle-fatiguing technique. Surgery was offered if closed reduction was unsuccessful, based on CFS, age or clinical assessment.

This study provides insight into the clinical procedures for closed reduction of DRFs in Denmark, emphasising that despite the lack of national guidelines, practices are generally similar across sites.

Haematoma block is, in general, a commonly used method to provide anaesthesia before closed reduction of DRFs. Adequate analgesia enhances patient comfort but may also contribute to better procedural conditions and reduction results [5, 16]. However, evidence on the optimal anaesthetic method for closed reduction of DRFs is currently insufficient [4, 6, 7]. Some studies suggest that haematoma block, while faster and easier to perform, may provide inferior analgesia and less satisfactory fracture reduction compared with intravenous regional anaesthesia [4, 5]. A systematic review examined the effects of PNB for closed reduction of DRF [7]. The review concluded that PNB may reduce procedural pain compared to other anaesthetic methods, including haematoma block, but the quality of current evidence is low and prone to bias. A randomised controlled trial investigating selective nerve blocks of the median and radial nerves did not find a reduction in procedural patient-reported pain. However, it concluded that PNBs improved the radiologically assessed success of the closed reduction and may reduce the subsequent need for surgery [6]. Given the limited correlation between radiographic bone alignment and patient-reported function in elderly patients, patient-reported outcomes, including pain, are essential in evaluating the treatment of DRFs [17].

More than half of the respondents perceived that analgesia with a haematoma block was sufficient, and a minority reported that it was inadequate. In contrast, studies on patient-reported pain show that patients often experience significant pain during closed reduction following a haematoma block [6, 7, 16, 18].

Reasons for the discrepancy mentioned above are speculative. Our survey has limited generalisability due to its small sample size. Furthermore,itreflects physicians' perspectives rather than patients' reports and may

underestimate the actual pain level experienced. A natural positive perception of existing local practices may also have influenced the physicians' assessment of quality and contributed to a lowered focus on further improvement. The respondents' assessments may also reflect that they are specialised physicians, experienced in performing haematoma blocks and closed reductions. However, most clinicians performing these procedures in daily practice are less experienced. Kakarlapudi et al. [19] found that patients with DRFs managed with haematoma block and closed reduction by junior physicians may need re-reduction more often than those treated by more experienced physicians. In contrast, Oakley et al. [5] reported that intravenous regional anaesthesia, even when treated by junior physicians, provided better analgesia and more successful closed reductions than haematoma blocks performed by more experienced clinicians, suggesting that alternative anaesthetic methods may be superior. Our study showed considerable variation in clinicians' experience performing haematoma block and closed reduction. However, treating clinicians tended to be younger physicians, often with less experience in the procedures than specialised physicians. Christensen et al. [6] support this, noting that only 3-4% of physicians performing the procedures were specialised physicians.

Manual reduction with finger-trap traction to induce muscle fatigue was the most commonly used closed reduction method, although half also used manual traction as a fatiguing technique. A systematic review found a minor advantage for finger-trap traction in restoring radial length and for manual traction in correcting dorsal tilt. However, this finding was not necessarily clinically important [9]. The authors conclude that more research is needed to identify the most effective reduction technique, a point supported by Handoll & Madhok [8]. Furthermore, Earnshaw et al. [20] found no differences in bone alignment or failure rates comparing finger-trap traction to manual reduction without prior muscle fatigue, which may explain why half of the physicians reported using reduction without induced muscle fatigue. The limited quantity and quality of existing literature on anaesthesia and closed reduction methods for DRFs may contribute to the lack of national clinical guidelines.

Study limitations

The results describe the current departmental clinical practice of closed reduction for DRFs based on a survey of physicians responsible for emergency departments and/or minor injury units. Thus, the individual patient treatment performed by each clinician is beyond the scope of this survey. The survey is, therefore, susceptible to information and response bias. The respondents' clinical experience levels were not recorded, which may have influenced the results.

Conclusions

Haematoma block followed by finger-trap traction to induce muscle relaxation before manual reduction is the most common departmental clinical practice used for closed reduction of DRFs in Denmark. Indication for surgery in cases of unsatisfactory reduction is based on various parameters, with the patient's functional level being the most common.

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Disclosure of Potential Conflicts of Interest. These are available together with the article at ugeskriftet.dk/dmj

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