

Short Communication

Distal Radius Manipulation under Anaesthetic can be Safely Performed by Advanced Practice Physiotherapists in the Emergency Department

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Abstract

The objective of this case series was to establish the ability of advanced practice physiotherapists in safely and effectively performing manipulation under anaesthetic of displaced distal radius fractures in the emergency department setting. A competency pathway of work-based learning, training and supervised practice is described, and 10 cases managed by an advanced practice physiotherapist are reviewed focusing on acceptability of the reduction and subsequent need for surgical fixation. All 10 cases were judged to have been manipulated appropriately, safely and to a satisfactory outcome by two orthopaedic consultants. 80% of cases went on to avoid requiring surgical fixation and were managed conservatively (a conversion rate that measures favorably against national conversion rates in the literature). We demonstrate the competency of appropriately trained advanced practice physiotherapists in manipulating displaced distal radius fractures under anaesthetic in an emergency department setting.

Keywords: Distal radius fracture; Manipulation; Advanced practice physiotherapist; Emergency department; Pentrox; Fracture fixation

Introduction

Distal radius fractures are the most commonly reduced fracture in the Emergency Department (ED) [1]. They account for nearly one sixth of all fractures presenting to the ED [2].

Fractures of the upper limb have significant financial and social implications for the people involved as well as health and social care costs to the wider NHS services [3]. Displaced fractures of the distal radius have been traditionally treated in the ED with manipulation to minimize the risk of developing neurological symptoms but can be definitive treatment for many patients [4].

When to reduce?

Reductions are performed for the improvement of neurological or vascular signs, reducing the risk of neurological symptoms developing or to improve alignment, and as definitive treatment [4]. Median nerve symptoms are the most common neurological complication of a distal radius fracture [5]. The clinician needs to be able to accurately assess and document a neurological examination of the upper limb. The quality of any reduction can influence definitive management and any reduction should aim for as close to anatomical position as possible [6]. Normal radiological relationships relating to distal radius fractures are:

- Radial inclination: Average of 23 degrees
- Radial height: Average of 11 mm
- Volar tilt: Average of 11 degrees [7,8].

Exact measurements of displacement and acceptable positions have been argued with Hsu et al. [5] stating:

- Radial height: Less than 5 mm shortening
- Radial inclination: Less than 5 degree change
- Articular step off: Less than 2 mm
- Volar tilt: Dorsal angulations less than 5 degrees

These measurements are projected to be acceptable levels of displacement, beyond which intervention would be required [6].

However, there is currently insufficient evidence to relate any radiological measurement to functional outcome [4]. In lieu of evidence the BSSH carried out a Delphi process of experts which stated that positive ulna variance ranked as the most important factor followed by dorsal tilt for extra-articular fractures. Intra-articular step was rated as the most important for intra-articular fractures.

The British Society for the Surgery of the Hand (BSSH) guidelines [4] is followed to guide the decision to reduce distal radius fractures in our emergency and orthopaedic departments. There is currently no research we are aware of to describe physiotherapists reducing such fractures, specifically advanced practitioners.

Analgesia

There are numerous ways to achieve adequate analgesia for the reduction of displaced distal radius fractures. NICE recommend intravenous regional anesthesia (Biers block) in adults [9] but this is not without potentially serious known complications ranging from thrombophlebitis, nerve damage, compartment syndrome, seizures and ultimately cardiac arrest and death [10]. NICE go on to recommend haematoma block as another option if BIER's block is not available [9]

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however this goes against British Orthopaedic Association guidelines [11]. Entonox or nitrous oxide was previous widespread practice but has been found to be inferior to haematoma block [12] and goes against BSSH and BOA best practice guidelines [4,11]. Procedural sedation is widely used across ED's for joint and long bone fracture reduction [13] but again is not without potential significant risks such as laryngospasm, hypoxia, and hypotension, bradycardia, causing general anesthesia or specific drug side effects. Add in it requires three clinicians (usually two doctors and a nurse) plus the use of a resus bay [14] for monitoring in an often-overburdened ED, other options may be desirable. A more recent option gaining traction in UK emergency departments is methoxyflurane (Penthrox). It is an inhalational anaesthetic and mild amnesic licensed for moderate to severe pain in the UK. To date there are no studies specifically looking at Penthrox and fracture reduction although its efficacy and safety as pain relief in anterior shoulder dislocation/relocation has been demonstrated [15].

The cases discussed here use a mixture of conscious sedation and Penthrox as our practice has evolved over time. Specifics on analgesia technique for the reduction of displaced wrist fractures are beyond the scope of this article.

Advanced practice

“Advanced clinical practice is delivered by experienced, registered health and care practitioners. It is a level of practice characterized by a high degree of autonomy and complex decision-making. This is underpinned by a master's level award or equivalent that encompasses the four pillars of: clinical practice; leadership and management; education; and research; with demonstration of core capabilities and area specific clinical competence. ACP embodies the ability to manage clinical care in partnership with individuals, families and carers. It includes the analysis and synthesis of complex problems across a range of settings, enabling innovative solutions to enhance people's experience and improve outcomes” [16].

Whilst advanced practice is an evolving field the exact accreditation and evidence required to perform at such levels and certain tasks remains unclear. The Chartered Society of Physiotherapy (CSP) go on to state advanced level practice is within the scope of the profession whereby “the scope of practice of physiotherapy is defined as any activity undertaken by an individual physiotherapist that may be situated within the four pillars of physiotherapy practice where the individual is educated, trained and competent to perform that activity” [17].

The question remains as to what level of training and by who is required to perform advanced tasks, more traditionally performed by doctors such as reduction of wrist fractures [18]. We describe a pathway of work-based learning, training and supervised practice as a route to competency and autonomy in the reduction of distal radius fractures via a case series.

Training

First to reduce a fracture the practitioner must understand the need for reduction as outlined above. In this instance the practitioner had completed a prior master's degree and underwent a one-year training supervision program by an orthopaedic and emergency medicine consultant respectively. This required formal learning, specifically related to the upper limb on fracture classification, assessment, neurological examination, radiographic interpretation, conservative management, and surgical management and its principals. Prior to commencing the reduction of distal radius fractures, alongside a

broader competency of fracture and joint reductions, the practitioner had specific teaching on fracture reductions, attended theatre to observe manipulation of such fractures under anaesthetic (with a hand surgeon) and had to observe each procedure and reflect on them. The practitioner then completed five cases under supervision of an emergency department consultant. Once deemed competent in the eyes of all consultant mentors individual practice was then followed with appropriate support. When reducing a fracture with Penthrox in our ED it is standard procedure to check with the supervising consultant the appropriateness of procedure as outlined in the trusts adult sedation policy. Furthermore, the practitioner is a non-medical prescriber allowing the prescription of Penthrox and had received specific training in its use.

The practitioner, as part of their orthopaedic role, had undergone specific training in informed consent and surgical listing. Thereby further demonstrating an understanding of which fractures needed intervention and also the ability to consent the patient as to the pros and cons of any intervention, or lack of, as part of a patient-centred approach to their care. It should be noted that at least as many patients have been appropriately counselled as to no intervention/reduction based on best evidence, patient circumstances and informed consent. The practitioner also attends monthly hand and radiology combined multidisciplinary meetings and is a part of the wider hand multidisciplinary team. Post reduction all cases were treated with a rigid splint (backslab) as per best practice guidelines (Table 1) [4,6].

Discussion

All wrist reductions were performed appropriately, safely and to a satisfactory outcome as judged by supervising emergency department consultants and on follow up review with two orthopaedic consultants. No adverse events were reported during or after any procedure.

Of the ten cases presented the first three required surgical intervention due to the nature of the fracture type and degree of displacement at the time of injury [19]. Two patients left the area post procedure and were lost to follow up. Of the remaining five cases four had conservative treatment showing an 80% conversion to non-surgical management. Two of these cases were offered surgical intervention but opted for conservative management. All patients made a satisfactory outcome when reviewing their discharge orthopaedic clinic letters. We demonstrate that with appropriate theoretical and practice-based learning, plus clinical supervision, advanced practice physiotherapists can safely perform the reduction of displaced distal radius fractures.

The 80% conversion rate to non-surgical management demonstrated compares favourably against the 59% reported in a recent multicentre observational cohort study that assessed outcomes for 83 patients with Colles' type distal radius fractures undergoing manipulation in the ED setting [1]. However, given the small number of patients reviewed in this case series, further research is required to achieve a more reliable comparison of conversion rates. It should also be added that further research is required as to the optimal treatment for displaced distal radius fractures.

Contribution of the Paper

Key messages of the article

- With the appropriate competency training, advanced practice physiotherapists can safely and effectively perform manipulation of displaced distal radius fractures under anaesthetic in the emergency department setting.

Table 1: Post reduction of all cases.

Age/Sex	Neurovascular compromise	Alignment	Analgesia	Reduction acceptable	Outcome
65/Female	Yes- reduced temperature and reduced cap refill	Grossly shortened and volar Barton type fracture	conscious sedation; propofol and fentanyl (Consultant administered)	Yes and normal circulation restored	Highly unstable fracture type therefore ORIF
61/Female	Median nerve paraesthesia	Positive ulna variance and dorsal tilt 30°	Conscious sedation; propofol and fentanyl (Consultant administered)	Yes and paraesthesia subsided fully	Comminuted likely to displace therefore ORIF
34/Female	Whole hand paraesthesia	Offended distal radius	Conscious sedation; propofol and fentanyl (Consultant administered)	Yes and paraesthesia subsided fully	Highly unstable fracture type therefore ORIF
54/Female	No - thought to be impending given displacement	Positive ulna variance and dorsal tilt 40°	Conscious sedation; propofol and fentanyl (Consultant administered)	Yes	Offered ORIF or conservative treatment; left area so lost to follow up
81/Female	No	Positive ulna variance and dorsal tilt 30°	Penthrox	Tilt restored to neutral; remains positive ulna variance	Acceptable functional outcome to the patient
42/Male	No	Positive ulna variance and dorsal tilt 20°	Penthrox	Yes	Leaving area; patient requested reduction on balance as was moving out of area next day
57/Female	No	Positive ulna variance and dorsal tilt 30°	Penthrox	Yes	ORIF as comminuted fracture configuration
58/Female	No	Positive ulna variance and dorsal tilt 30°	Penthrox	Yes	Conservative (listed for ORIF by one surgeon; position deemed acceptable by treating surgeon on the day)
62/Female	No	Positive ulna variance and dorsal tilt 30°	Penthrox	Yes	Conservative treatment
63/Male	No - thought to be impending given displacement	Positive ulna variance and dorsal tilt 40°	Penthrox	Yes	Offered ORIF; opted conservative by patient

- Outcomes of reduction performed by advanced practice physiotherapists are comparable, if not superior, to prior published literature.

What this paper adds

To the best of our knowledge this is the first piece of research that demonstrates the abilities of advanced practice physiotherapists in performing this procedure in the emergency department setting.

- This paper also describes a competency pathway of work-based learning, training and supervised practice which can be utilized by aspiring advanced practice physiotherapists in the emergency department setting to achieve competency in performing this procedure.
- The demonstration of such competency-based routes in advanced practice takes increased meaning with the advent of Health Education England centre for advanced practice.

References

1. Malik H, Appelboam A, Taylor G. Colles' type distal radial fractures undergoing manipulation in the ED: a multicentre observational cohort study. *Emerg Med J*. 2020;37(8):498-501.
2. Goldie BS. Distal radius fractures in adults. *Orthopaedic Proceedings*. 2002;84-B(Suppl 3):358.
3. Sheehan WJ, Williams MA, Paskins Z, Costa M, Fernandez MA, Gould J, et al. Research priorities for the management of broken bones of the upper limb in people over 50: a UK priority setting partnership with the James Lind Alliance. *BMJ Open*. 2019;9:e030028.
4. The British Society for the Surgery of the Hand (BSSH). Best practice for management of Distal Radial Fractures (DRFs). 2018.
5. Hsu H, Fahrenkopf MP, Nallamothu SV. Wrist Fracture. 2021.
6. Lichtman DM, Bindra RR, Boyer M, Putnam MD, Ring D, Slutsky D, et al. Treatment of Distal Radius Fractures. *JAAOS*. 2010;18(3):180-9.
7. Garner MR, Schottel PC, Thacher RR, Warner SJ, Lorich DG. Dual Radial Styloid and Volar Plating for Unstable Fractures of the Distal Radius. *Am J Orthop (Belle Mead NJ)*. 2018;47(3).
8. Bessho Y, Nakamura T, Nishiwaki M, Nagura T, Matsumoto M, Nakamura M, et al. Effect of decrease in radial inclination of distal radius fractures on distal radioulnar joint stability: a biomechanical study. *J Hand Surg Eur Vol*. 2018;43(9):967-73.
9. NICE Guideline NG38. Fractures (non-complex): assessment and management. 2016.
10. Kraus GP, Rondeau B, Fitzgerald B. Bier Block. *StatPearls*. 2020.
11. British Orthopaedic Association Audit Standards for Trauma. The Management of Distal Radial Fractures. British Orthopaedic Association. 2017.
12. Mann KH, Fan KP, Chan TN, Yue YM, Sin FP, Lam KW. A prospective clinical trial comparing self-administered nitrous oxide and haematoma block for analgesia in reducing fracture of the distal radius in an emergency department. *Hong Kong J Emerg Med*. 2010;17(2):126-31.
13. Vinson DR, Hoehn CL. Sedation-assisted Orthopedic Reduction in Emergency Medicine: The Safety and Success of a One Physician/One Nurse Model. *West J Emerg Med*. 2013;14(1):47-54.
14. Royal College of Emergency Medicine. Safe Sedation of Adults in the Emergency Department. 2012.
15. Umama E, Kelliher JH, Blom CJ, McNicholl B. Inhaled methoxyflurane for the reduction of acute anterior shoulder dislocation in the emergency department. *CJEM*. 2019;21(4):468-72.
16. NHS Multi-professional framework for advanced clinical practice in England. 2017.
17. CSP. Advanced practice in physiotherapy. 2016.
18. Dailey SK, Miller AR, Kakazu R, Wyrick JD, Stern PJ. The Effectiveness of Mini-C-Arm Fluoroscopy for the Closed Reduction of Distal Radius Fractures in Adults: A Randomized Controlled Trial. *J Hand Surg Am*. 2018;43(10):927-31.
19. Costa MJ, Achten J, Plant C, Parsons NR, Rangan A, Tubeuf S, et al. UK DRAFFT - A Randomised Controlled Trial of Percutaneous Fixation with Kirschner Wires versus Volar Locking-Plate Fixation in the Treatment of Adult Patients with a Dorsally Displaced Fracture of the Distal Radius. *Health Technol Assess*. 2015;19(17):1-124.