Specific Question:

Does the Relative motion regime (including the use a Yoke splint) provide improved outcomes (finger ROM, strength, with fewer complications of tenolysis and reduced rupture rates) compared to usual care in the rehabilitation of finger extensor tendon repairs in zones 4 to 7? (Usual care includes static and dynamic splints with exercise regimes).

Clinical bottom line

There is no high-quality evidence comparing usual care with ‘relative motion’ regimes using the Yoke splint.

Why is this important?

Following the integration to create the University Hospitals of North Midlands, differing clinical practices were apparent between the Therapies Departments of the County Hospital and Royal Stoke Hospital.

The introduction of a ‘Yoke’ or relative motion extension splint (RMES) regime to the Occupational Therapy Hand team at Royal Stoke Hospital raised questions as to the potential improved outcomes for patients recovering from extensor tendon repairs. The Therapies management team wanted to explore the current evidence to establish its introduction at the Royal Stoke site.

In addition to this, the Derby Hospitals Teaching Foundation Trust (Pulvertaft Hand Unit) had recently changed guidance to include the RMES for extensor tendon repairs Zones 4-7 and was asked to collaborate on the CAT (Chloë Kirk/Pilbeam & Victoria Jansen).
Inclusion Criteria

<table>
<thead>
<tr>
<th>Description</th>
<th>Search terms</th>
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<tbody>
<tr>
<td>Adults undergoing finger extensor tendon repairs in zones 4 to 7; in secondary care hospitals</td>
<td>#Tendon injuries, Fingers Extensor tendons&quot; OR &quot;extensor tendon repairs</td>
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<tr>
<td>Relative motion regime using the Yoke splint or Relative Motion extension splint (RMES) or Immediate Continuous Active Motion (ICAM)</td>
<td>#SPLINTS OR #ORTHOSES Yoke splint&quot; OR &quot;yoke orthosis #MOTION or RMR&quot; OR &quot;relative motion regime&quot; or &quot;relative motion&quot; OR ICAM</td>
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<tr>
<td>Usual care (static and dynamic splints with exercise regimes)</td>
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<tr>
<td>Finger range of movement Finger / grip strength? Reduced failure rates of tendon rupture Reduced tenolysis</td>
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<td>RCT, cohort, systematic and scoping reviews, case studies</td>
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Routine Databases Searched
Clinical Knowledge Summaries, PEDro, BMJ Updates, Clinical Evidence, TRIP, Database, NICE, HTA,Bandolier,The,CochraneLibrary,Medline,Cinahl,Embase,PsycInfo,Professional websites. Joanna Briggs Institute, Web of science, Sports discus and Pub med

Date of search- 28th June 2017 and updated 17th May 2018
Search timeframe: database inception until May 2018
Results of the search

Unique studies downloaded 27

Potential relevant 11
New search 2018 added 2 Studies

5 Included studies
2 Systematic reviews
1 scoping review
1 RCT abstract
1 comparative study

See Table 1

Excluded studies
6 studies were excluded as they did not answer the CAT question posed.

See Table 2
### Table 1- Detail of included studies

<table>
<thead>
<tr>
<th>First Author, year and type of study</th>
<th>Population and setting</th>
<th>Intervention or exposure tested</th>
<th>Study results</th>
<th>Assessment of quality and comments</th>
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</thead>
</table>
| **Hirth 2016**
Scoping review for RMS | RMES in extensor tendon repair zones IV-VII, most often used with wrist splint. Australia Author Developed countries secondary care settings | All except 1 paper (Hirth 2011) are case studies or case series of RMES regime. None compare with CAM, Hirth 2011 compares RMES to immobilisation. | 371 patients, 11 studies (5 unpublished studies). The bulk of excellent and good results, with no reported tendon ruptures suggest RME for zones IV-VII ET repairs (commenced within the first postoperative week) indicates that it is not only safe but also advised. | Scoping review, good methods for literature search & appraisal, additionally searched grey literature & approached authors/experts for input to ensure no missing data and for feedback on the results. Studies have low SEQUES scores – poor quality of evidence, no universal outcomes. RMES is favourable to immobilisation for motion and RTW |
| **Hirth 2011**
Retrospective and prospective case review mRMS | Zone 5-6 extensor repair patients Secondary care Melbourne, Australia | Retrospective review: 4 weeks immobilisation then 4-6 weeks avoidance of high risk activities. Prospective: 4 weeks RMES & night splint and 4-6 weeks RMES only. | N=16 immobilised N=23= mRMS Significantly greater ROM at 6 weeks in RMES group ISQ by 12 weeks. RMES returned to work on average 42 days earlier. No tendon ruptures either group. | Good background & justification for no wrist splint with RMES in these zones. Good description of splints and protocols. Level 4 evidence, no sensitivity analyses varying surgeons and therapist’s potential for bias. RMES achieved better outcomes (greater ROM and earlier RTW) compared to immobilisation |
| **Collocott et al. 2016**
IFSHT Conference abstract RCT Randomised prospective
CK saw this presented as free paper | Zone 5 and 6 Extensor repair Patients Secondary care Auckland, New Zealand | Randomised to CAM or RMES regime Recruited January 2015-February 2016 Reviewed at 4-8 weeks | N=42 Jan 2015-Feb 2016 No ruptures. 1 tenolysis on RMES group Outcomes Sollerman Hand Function Test (SHFT), days return to work, total active motion (TAM) grip strength, Quick DASH & satisfaction 8 weeks CAM RMES SHFT 75 76 RTW median 20 18 days Quick DASH 14 11 TAM 209.1° 236.4° Mean grip compared to contra-lateral side 73.8% 82.8% Splint Satisfaction 43% 75.9% | Robust RCT, awaiting full publication First ever RCT in this population Small sample, representative of trauma population RMES Participants demonstrated better return to functional use, better ROM and higher splint satisfaction compared to the CAM participants |
<table>
<thead>
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<tr>
<td>Collocott et al 2017 A systematic review</td>
<td>Extensor tendon repairs zones 5 &amp; 6 Developed countries secondary care settings Author- Auckland, New Zealand.</td>
<td>Early active mobilisation (EAM): 2 regimes – Controlled active motion (CAM) &amp; RMES.</td>
<td>N=12 studies, 692 participants. Similar satisfactory ROM &amp; grip strength outcomes reported. Participants treated with RMES protocol returned to work earlier than those treated with CAM protocol. No ruptures were reported with an RMES protocol while small numbers of ruptures were reported in participants treated with a CAM protocol.</td>
<td>The CAM &amp; RMES protocols were not directly compared &amp; the studies describing RMES protocols are of a lower level of evidence &amp; poorer methodological quality than those describing CAM protocols. Heterogeneity of outcome measures used in the included studies meant that it was not possible to perform a meta-analysis. RMES has no ruptures and earlier return to work than the CAM regime</td>
</tr>
<tr>
<td>Wong 2017 A systematic review</td>
<td>Extensor Tendon repairs zones 4-8 Developed countries secondary care settings Author Baltimore, USA.</td>
<td>Early active motion regimes, CAM &amp; RMES, static and dynamic splint (DES) rehabilitation protocols 6 RCTs n=265 3 prospective cohort n=376 2 retrospective cohort n=104</td>
<td>N= 11 633 participants. ROM during treatment (4-8 weeks) &amp; grip strength were greater with DES (191° -214°: 35-38Kg/ 89% of contralateral side) &amp; RMES (205° -236°: grip 85-89% of contralateral side). Compared to static orthosis (79° -202°: 23-34Kg/ 59% of contralateral side). Results not presented for EAM using a static splint except that RTW for RMES was mean 3 weeks &amp; for 9.4 weeks for those using a static orthosis. 1 study reported ruptures, 1 with EAM group &amp; 2 with DES.</td>
<td>Average quality evidence supports the use of early active motion as the superior range of motion protocol, but optimal orthosis to deliver EAM could not be determined. Narrative summary heterogeneity of outcome measures used meant that it was not possible to perform a meta-analysis. Patient tolerance of DES was discussed as being a challenge, as well as the increased cost of the splint &amp; greater number of therapy appointments for this and the static regime. RMES was discussed as small, light and easy to fabricate</td>
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</table>
Summary
This review found 5 studies that were relevant to answer the question ‘Does the Relative motion regime (including the use a Yoke splint) provide improved outcomes (finger ROM, strength, with fewer complications of tenolysis and reduced rupture rates) compared to usual care in the rehabilitation of finger extensor tendon repairs in zones 4 to 7? Usual care includes static and dynamic splints with exercise regimes.

Two of the studies were systematic reviews, and one a scoping review. These reviews included studies with relative motion that were cohort studies but without direct comparisons to other early active motion protocols, so the overall study quality for RMES is low, but suggests that the relative motion protocol is safe with no increased rate of tendon rupture.

One study (Hirth 2011 also included in the systematic review) compared a retrospective cohort of immobilisation with a prospective case series of relative motion. The results suggest relative motion gives better results in the short term, but by 3 months the results are equal.

The studies comparing controlled motion (using a static splint and a dynamic splint) to immobilisation, are of higher quality and the results favour controlled motion. An abstract was found for a single RCT of controlled active motion versus relative motion protocols, and the results are promising in favour of relative motion, demonstrating better return to functional use, better range of motion and higher splint satisfaction.

Clinical Bottom Line
There is no high-quality evidence comparing usual care with relative motion regimes using the Yoke splint. Therefore, no change in current practice is indicated but practice should be reviewed after the publication and critical review of the first RCT conducted to answer fully the question posed. This should occur within the next year.

In Derby Hospitals their clinical experience/audit findings (Pilbeam et al., 2016) supported by the evidence gained (including an RCT abstract) demonstrates the RMES regime good outcomes, with no increased risk of rupture.

Implications for Practice/research
There is no high-quality evidence comparing usual care with ‘relative motion regimes using the Yoke splint; but clinical experience (case series) and an abstract for a completed RCT demonstrates good outcomes, the splint is smaller, less restrictive allowing earlier return to function, work and reduced therapy attendances. Derby have decided to use and audit the RMES (yoke) regime and have internal data (Pilbeam et al., 2016, 2017, 2018) to confirm it is safe (no difference in rupture rates) and delivers improved outcomes (increase ROM and reduced scar tethering and reduced therapy appointments). The Royal Stoke site is continuing to audit the outcomes for patients managed in the Yoke splint with RMES regime.

Other sites may prefer to not change current practice and await the publication and their own critical review of the completed RCT (Collocott et al.2016) which will help to answer fully the question posed. Standardisation of outcome measurement would support future research.
What would you tweet? (140 characters)
Evidence building of favourable outcomes using relative motion extension splinting (RMES) aka yoke splint for extensor tendon (zone IV-VI) repairs. Awaiting full RCT publication #moveearly #handtherapy #CATbank @VictoriaJanse11 @CPIlbeamKirkPT @KeeleCATgroup

References


Collocott et al. Optimal early active mobilisation protocol after extensor tendon repairs in zones V and VI: A systematic review of literature. Hand Therapy. 2017; 0(0): 1-16

