

**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).

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Musculoskeletal Research Facilitation Group (CAT Group)  
Date: 3<sup>rd</sup> August 2018

**Inclusion Criteria**

	Description	Search terms
<b>Population and Setting</b>	Adults undergoing finger extensor tendon repairs in zones 4 to 7; in secondary care hospitals	#Tendon injuries, Fingers Extensor tendons" OR "extensor tendon repairs
<b>Intervention or Exposure</b>	Relative motion regime using the Yoke splint or Relative Motion extension splint (RMES) or Immediate Continuous Active Motion (ICAM)	#SPLINTS OR #ORTHOSES Yoke splint" OR "yoke orthosis  #MOTION or RMR" OR "relative motion regime" or "relative motion" OR ICAM
<b>Comparison, if any</b>	Usual care (static and dynamic splints with exercise regimes)	
<b>Outcomes of interest</b>	Finger range of movement Finger / grip strength? Reduced failure rates of tendon rupture Reduced tenolysis	
<b>Types of studies</b>	RCT, cohort, systematic and scoping reviews, case studies	

**Routine Databases Searched**

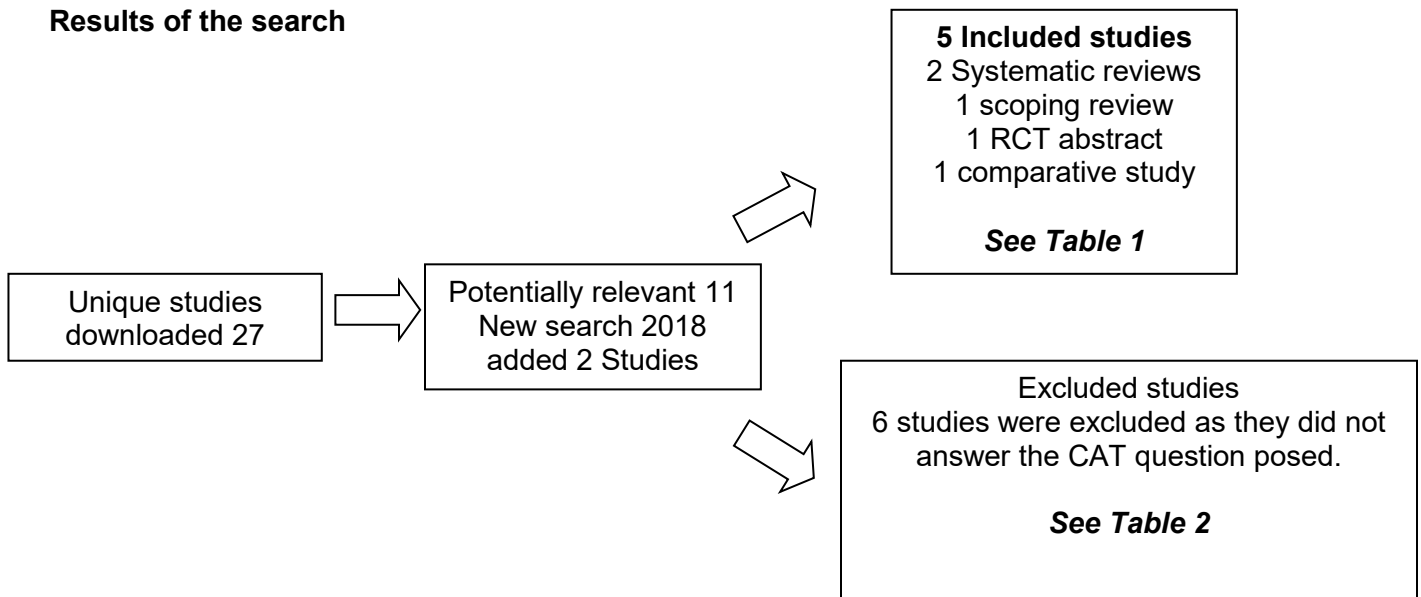
Clinical Knowledge Summaries, PEDro, BMJ Updates, Clinical Evidence, TRIP, Database, NICE, HTA, Bandolier, The Cochrane Library, Medline, Cinahl, Embase, PsycInfo, Professional websites. Joanna Briggs Institute, Web of science, Sports discuss and Pub med

**Date of search- 28<sup>th</sup> June 2017 and updated 17<sup>th</sup> May 2018**  
**Search timeframe: database inception until May 2018**

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Date CAT completed: 3/08/18  
Date CAT to be reviewed: July 2020

**Results of the search**



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Table 1- Detail of included studies

First Author, year and type of study	Population and setting	Intervention or exposure tested	Study results	Assessment of quality and comments																					
<b>Hirth 2016</b>  <b>Scoping review for RMS</b>	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 SEQUEX scores – poor quality of evidence, no universal outcomes.  <b>RMES is favourable to immobilisation for motion and RTW</b>																					
<b>Hirth 2011</b>  <b>Retrospective and prospective case review mRMS</b>	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.  <b>RMES achieved better outcomes (greater ROM and earlier RTW) compared to immobilisation</b>																					
<b>Collocott et al. 2016</b>  <b>IFSHT Conference abstract RCT Randomised prospective</b>  <b>CK saw this presented as free paper</b>	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  <table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>CAM</td> <td>RMES</td> </tr> <tr> <td>SHFT</td> <td>75</td> <td>76</td> </tr> <tr> <td>RTW median</td> <td>20</td> <td>18 days</td> </tr> <tr> <td>Quick DASH</td> <td>14</td> <td>11</td> </tr> <tr> <td>TAM</td> <td>209.1°</td> <td>236.4°</td> </tr> <tr> <td>Mean grip compared to contra-lateral side</td> <td>73.8%</td> <td>82.8%</td> </tr> <tr> <td>Splint Satisfaction</td> <td>43%</td> <td>75.9%</td> </tr> </table>		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  <b>RMES Participants demonstrated better return to functional use, better ROM and higher splint satisfaction compared to the CAM participants</b>
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First Author, year and type of study	Population and setting	Intervention or exposure tested	Study results	Assessment of quality and comments
<b>Collocott et al 2017</b> <b>A systematic review</b>	Extensor tendon repairs zones 5 & 6  Developed countries secondary care settings  Author- Auckland, New Zealand.	Early active mobilisation (EAM): 2 regimes – Controlled active motion (CAM) & RMES.	N=12 studies, 692 participants. Similar satisfactory ROM & 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.	The CAM & RMES protocols were not directly compared & the studies describing RMES protocols are of a lower level of evidence & 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  <b>RMES has no ruptures and earlier return to work than the CAM regime</b>
<b>Wong 2017</b> <b>A systematic review</b>	Extensor Tendon repairs zones 4-8  Developed countries secondary care settings  Author Baltimore, USA.	Early active motion regimes, CAM & RMES, static and dynamic splint (DES) rehabilitation protocols  6 RCTs n=265  3 prospective cohort n=376 2 retrospective cohort n=104	N= 11 633 participants.  ROM during treatment (4-8 weeks) & grip strength were greater with DES (191° -214°: 35-38Kg/ 89% of contralateral side) & 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 & for 9.4 weeks for those using a static orthosis.  1 study reported ruptures, 1 with EAM group & 2 with DES.	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.  <b>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.</b> <b>RMES was discussed as small, light and easy to fabricate</b>

## 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 S, Kelly E, Ellis R, Foster M, Myhr H. Can Relative Motion Extension Splinting Provide Earlier Return to Hand Function Than a Controlled Active Motion Protocol? A Randomized Clinical Trial *Hand* 2016 Volume: 11 issue: 1\_suppl, page(s): 141S-142S

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

Hirth M, Bennett K, Mah E, et al. Early return to work and improved range of motion with modified relative motion splinting: a retrospective comparison with immobilization splinting for zones V and VI extensor tendon repairs. *Hand Therapy*. 2011; 16: 86–94. DOI: 10.1258/ ht.2011.011012.

Hirth et al. Relative motion orthoses in the management of various hand conditions: A scoping review.(includes abstract); *Journal of Hand Therapy*. Oct-Dec2016; 29(4): 405-432. (28p) (Article) ISSN: 0894-1130 AN: 120614968

Wong AL, Wilson M, Girnary S, et al. The optimal orthosis and motion for extensor tendon injury in zones IV-VII: A systematic review. *Journal of Hand Therapy*. 2017; 1–9. DOI: dx.doi.org/10.1016/j.jht.2017.02.013.