First Metatarsocuneiform Arthrodesis and Early Weight Bearing Post-operative regime. A Systematic review of the literature:

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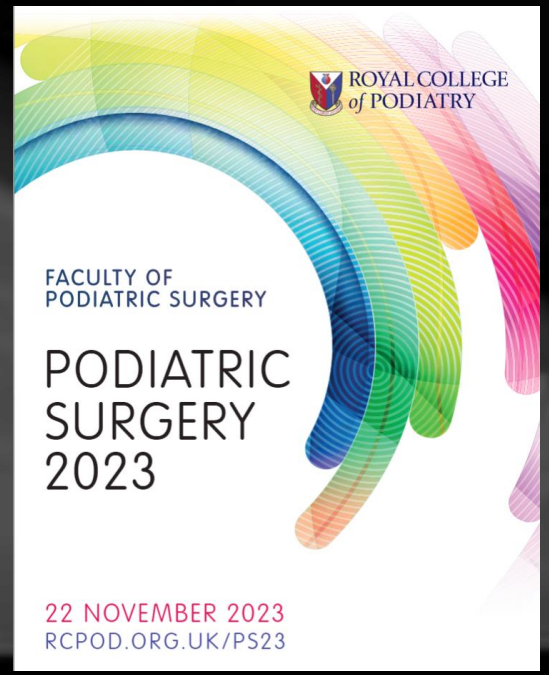


Faculty of Podiatric Surgery. Conference 2023

So, what…..!

Systematic Review
Early weight bearing status for the first MCJ arthrodesis

Objectives:

- Non-union rate
- Fixation modalities
- Post operative regime
- Associated complications.

Methodology:

Inclusion criteria:

Search

Flowchart:

Coleman methodology score:

Results:

Of the 25 studies, 3 were prospective (level III) and the remaining 22 were retrospective (level IV).

The mean value of the CMS score was 45.5 points (range 12-81).

The 25 included studies reported on a total of 1,839 procedures.

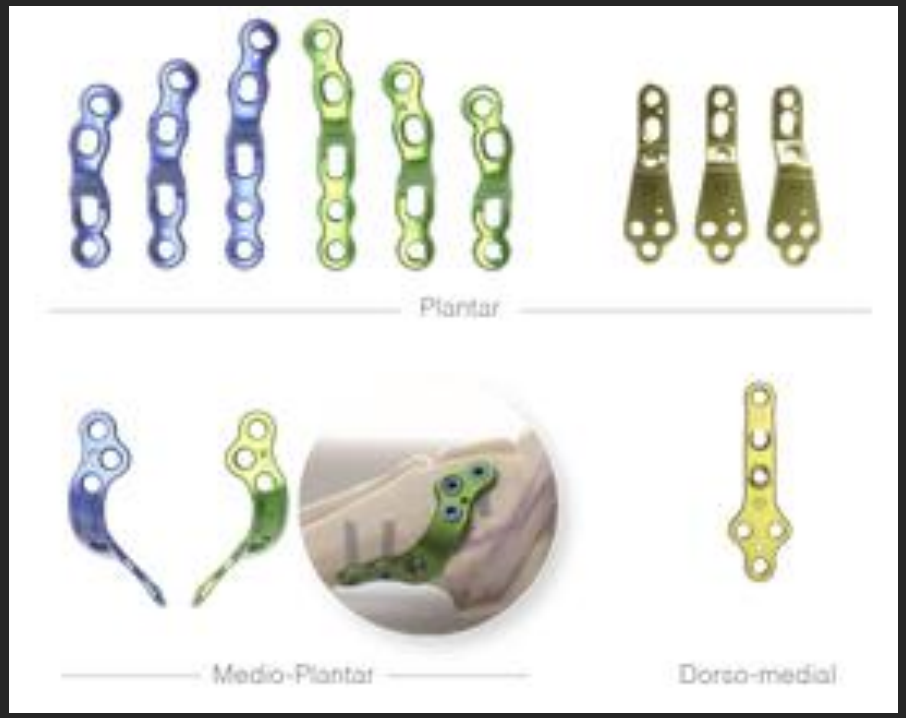
A mean age at surgery of 43.8 years.

There was heterogeneity on patient population chosen due to the variation in inclusion/exclusion criteria, although all groups met this systematic review's inclusion/exclusion criteria for early weight bearing status (≤6 weeks).

Non-union rate

- The non-union rate was reported in 25 studies with a mean rate of 2.9% (0-9.5%).
- Remaining 22 studies therefore had non-union rate of 1.7%

Fixation construct



Fixation construct	
Locking plate with compression screw	615
X2 crossed screw	424
X3 crossed screw	293
Biplanar locking plate	236
Plantar locking plate with compression screw	151
Fusion rod/screw	41
Fusion rod/screw	27
X2 crossed screw with additional k wire	24
X2 crossed screw with endo button suture	12
Non-locking plate/ screw	11
Locking plate	3
Screw/K wire	2

* Of the x2 crossed screw construct, 124 procedures (29%) were not clarified fully to determine whether two or a third screw was used.

Early weight bearing post op. protocol

- There was heterogeneity amongst the reported regime for early weight bearing status.
- Seven studies reported full immediate weight bearing (Manchanda *et al.* 2021, Brissey *et al.* 2021, Ray *et al.* 2019, Gutteck *et al.* 2015, Klos *et al.* 2013, Basile *et al.* 2010, Kazza & Singh, 2009).
- Three of these studies used a plantar locking plate with compression screw, 2 studies used biplanar locking plates and 2 further studies used a crossed screw construct (one with an additional Kirschner wire as a point of fixation).
- The mean non-union rate for this sub-group of immediate weight bearing was 1.48% (0-5.2%).

Definitions……

- A number of studies provided various definitions for weight bearing status such as ‘protected weight bearing’, ‘pain as tolerated’, ‘with crutch assistance’ (Brissey *et al.* 2021, Mayet *et al.* 2019, Ray *et al.* 2019, King *et al.* 2015, Klos *et al.* 2013, Blitz *et al.* 2010, Sorensen *et al.* 2009).
- Unfortunately, these examples fail to provide useful information for clarity on patient compliance and to what extent patient were placing increasing degrees of weight through the arthrodesis site during the initial 6-week period.

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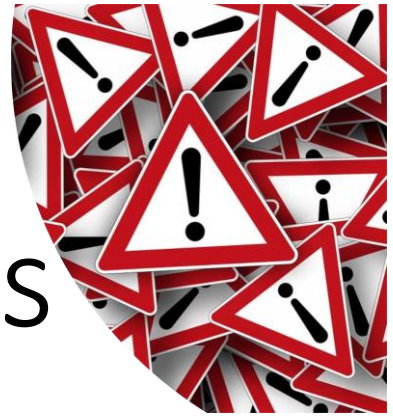
Return to footwear

Seven studies reported on transition to normal footwear at:

Return to normal footwear:	
6 weeks	Brissey *et al.* 2021, Langan *et al.* 2020, Ray *et al.* 2019, Sorensen, 2009
7 weeks	Menke *et al.* 2011
6-8 weeks	Cottom & Vora, 2013, Kazza & Singh, 2009

Rate of complications



- The rate of complications were **recorded in 19 studies** and are presented in descending order of frequency.
- **Hardware irritation requiring removal** was the most common complication being reported in 14 studies with a **mean incidence of 7.8%** (0-21%).

Complication:	Percentage:
Hardware irritation requiring removal	7.8% (14 studies)
Hallux varus	3.4% (8 studies)
Recurrence	3% (6 studies)
Wound healing problems	1.8% (5 studies)
Hardware irritation (not removed)	6.6% (4 studies)
Neuritis	2.8% (4 studies)
Delayed union	2.3% (4 studies)
Transfer metatarsalgia	9% (3 studies)
Continued pain	1.4% (3 studies)
Paraesthesia	8.2% (3 studies)
Malunion	5.8% (2 studies)
Metatarsal fracture	3.4% (2 studies)
Sesamoiditis	6.6% (1 study)
PE	1% (1 study)
DVT	1.7% (1 study)
Broken hardware	5.2% (1 study)
Tibialis anterior rupture	0%

Limitations:

Selection bias:

Ray *et al.* (2019) reporting a non-union rate of 1.6% in 62 procedures. However, it is reported as a symptomatic non-union rate, potentially suggesting that a number of asymptomatic non- union cases may have been left out of the overall reported figure.

Follow up:

Only 15 studies had a mean follow up duration of ≥12months. Thus, has been highlighted within the literature to be a major limitation of any studies investigating hallux valgus surgery.

Conclusion:

- A total of **1,839 first MCJ arthrodesis procedures** that followed an early weight bearing regime (≤ 6 weeks) were analysed.
- **Non-union** rate of **2.9%.**
- A wide variation in fixation modality were used and due to the high level of heterogeneity between fixation constructs and weight bearing regime it is difficult to advocate one fixation superiority over another.
- **Complication rates** were low with the highest reported complication being **hardware irritation requiring removal** (7.8%).
- Ultimately, there is a need for improvements in the scientific quality of studies that report, combine, and compare groups of patients who undergo a first MCJ arthrodesis procedure highlighted by Symeonidis & Anderson (2021).

Survey First metatarsocuneiform arthrodesis

- Hallux valgus correction in an uncomplicated patient

1. How many first Metatarsocuneiform joint arthrodesis procedures do you perform annually, and which deanery do you reside in?
2. What is your fixation construct?
3. What post operative foot device do you use?
4. When do you initiate weight-bearing regime?
5. When do you expect patients to be back to normal supportive footwear?
6. What is your post operative regime - transition to full weight bearing?
7. What is your non-union rate?
8. What is your incidence rate of hardware irritation requiring removal?
9. How many years have you been performing this procedure?
10. What is your typical duration of VTE chemoprophylaxis?

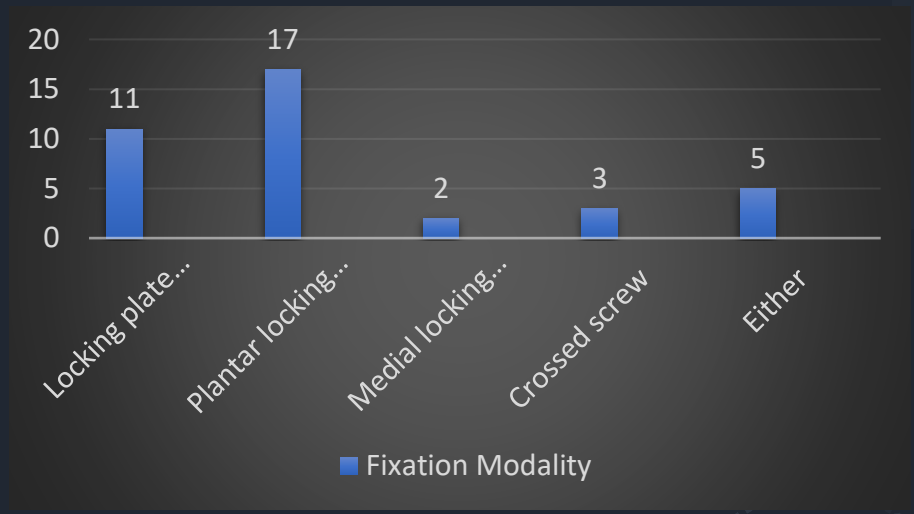
Survey First metatarsocuneiform arthrodesis

- Hallux valgus correction in an uncomplicated patient

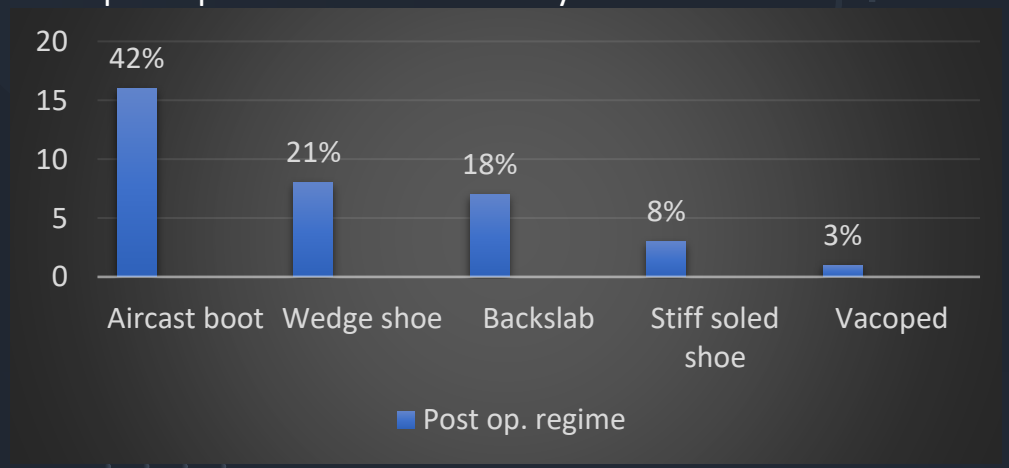
1. How many first Metatarsocuneiform joint arthrodesis procedures do you perform annually, and which deanery do you reside in?

	Response rate: Total = 38	Volume (mean per annum) Total = 493 (range 2-60)
Northern	9	17.6
Central, Midlands, Wales & Ireland?	9	17.4
Southern	13	13.7
Not reported	7	15.2

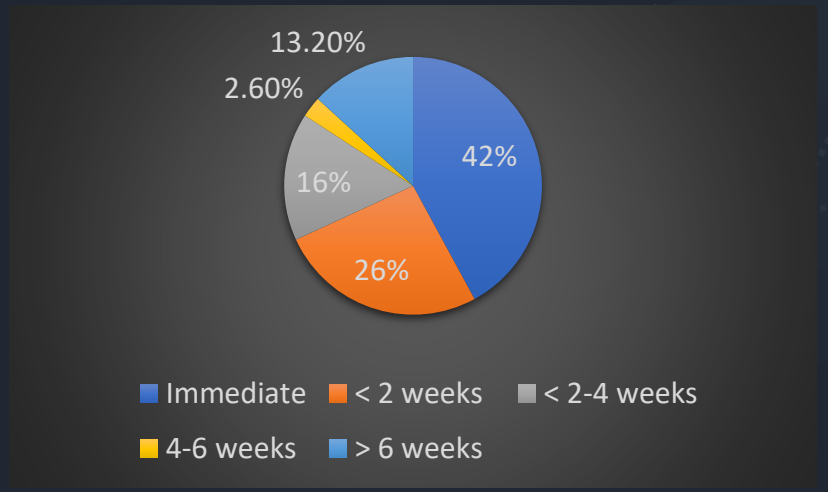
2. What is your fixation construct?



3. What post operative foot device do you use?



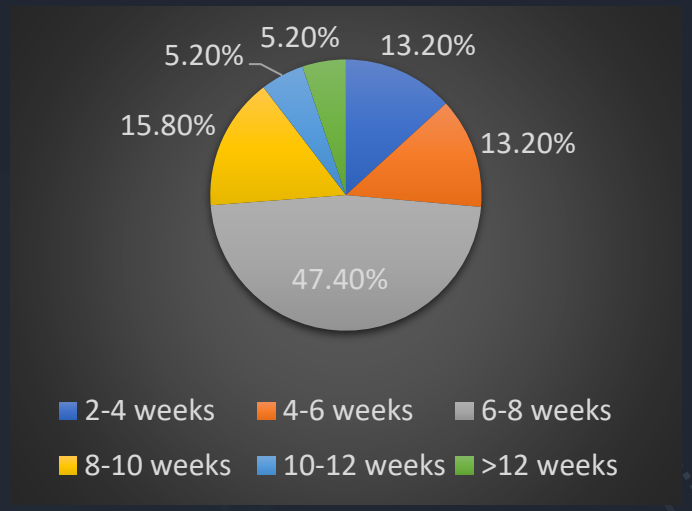
4. When do you initiate weight-bearing regime?



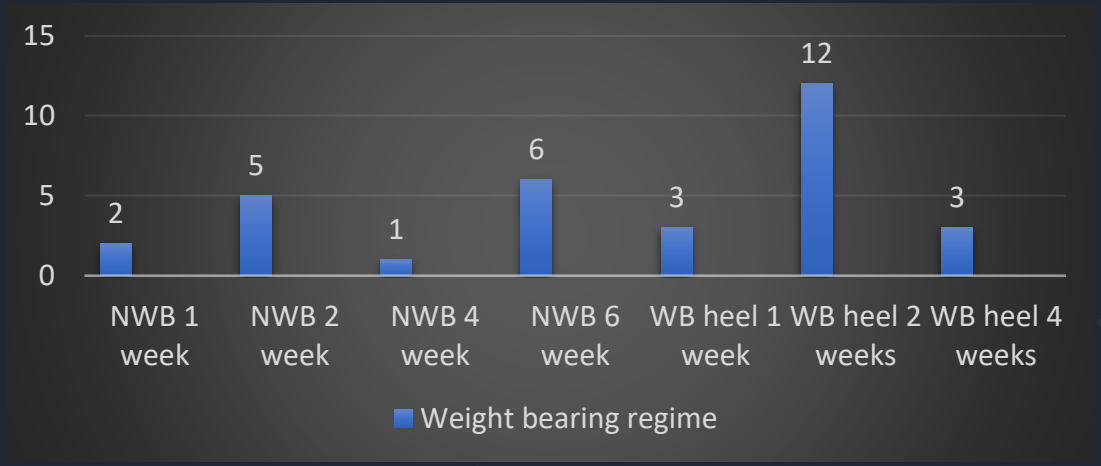
Survey First metatarsocuneiform arthrodesis

SurveyMonkey

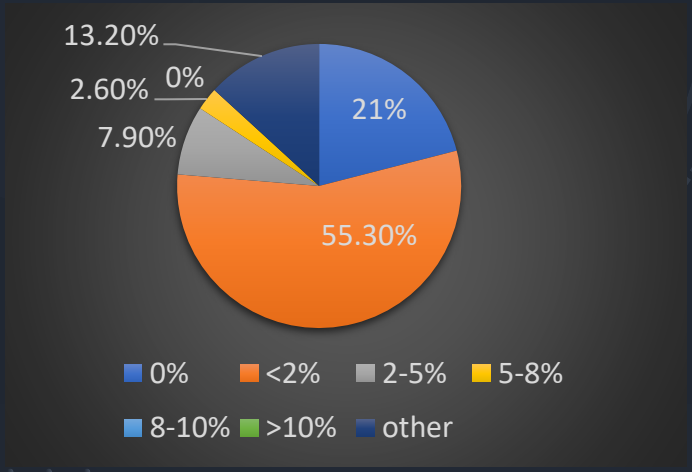
5. When do you expect patients to be back to normal supportive footwear?



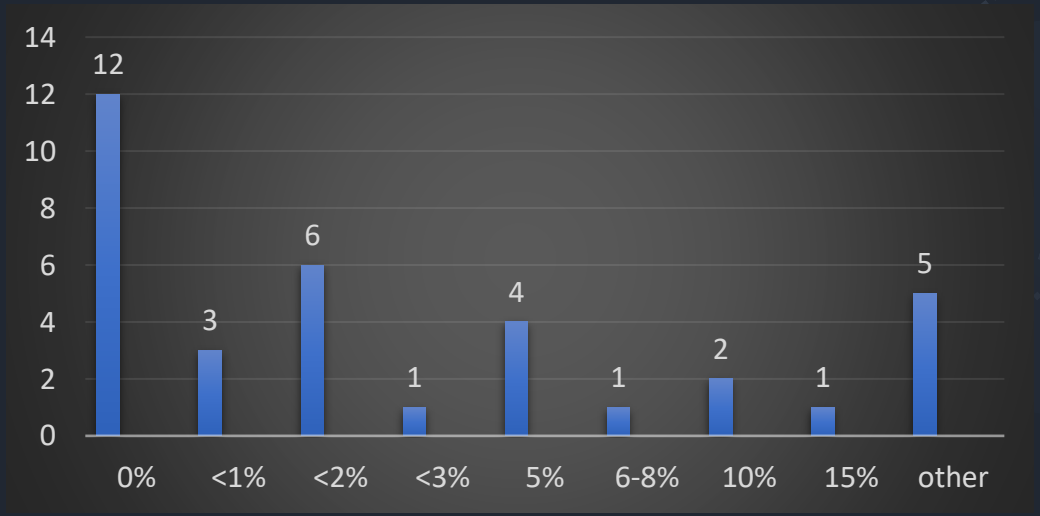
6. What is your post operative regime - transition to full weight bearing?



7. What is your non-union rate?



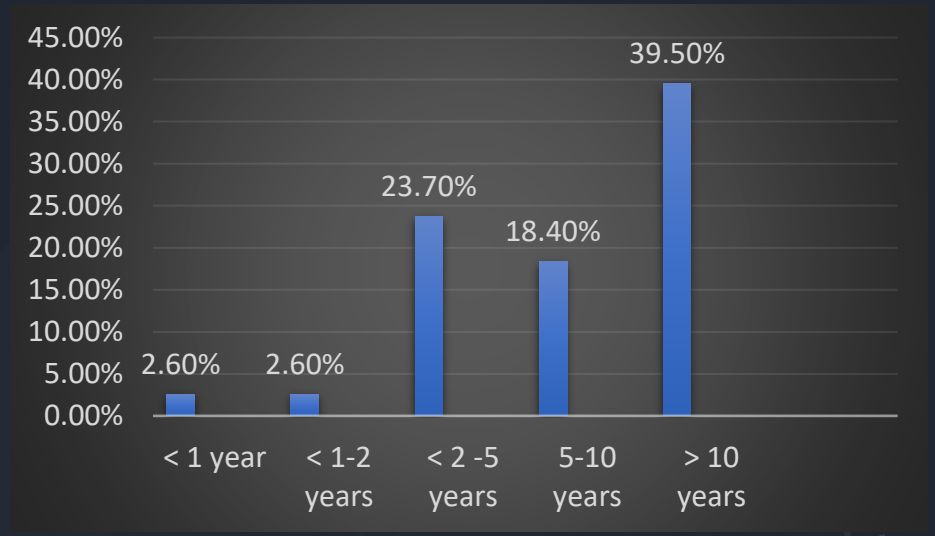
8. What is your incidence rate of hardware irritation requiring removal?



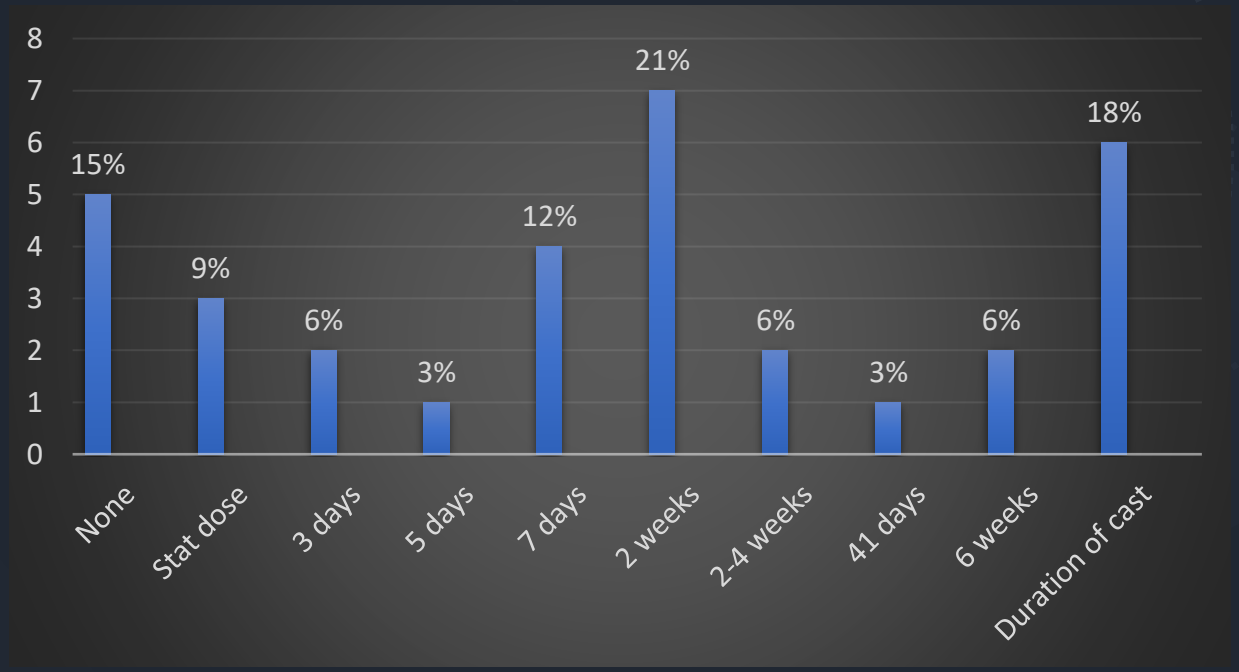
Survey First metatarsocuneiform arthrodesis

SurveyMonkey

9. How many years have you been performing this procedure?



10. What is your typical duration of VTE chemoprophylaxis?



Thanks…

Questions!

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Survey First metatarsocuneiform arthrodesis

No weight bearing for 24 hrs until pop block has worn off then heel weight bearing for 4 weeks followed by flat weight bearing for 2 week with post op shoe.

Heel only for 2/52. Full wt bearing thereafter with activity restricted to 15min/hr until 8/52 post op

Can walk on heel for first 2 weeks then wt bear fully in stiff soled surgical shoe.

Wedged Post op shoe for 2 weeks then transfer into air cast for a further 4 weeks.

Heel wb immediately after pop block were off. Foot flat at 2/52.

heel weightbearing for 2 weeks in post-op shoe then full weightbearing in trainers at 2 weeks but limited activity level.

Aircast boot 2 weeks. Week 1 NWB. Week 2 WBAT, trainer at 2 weeks if all is well.

Inclusion criteria:

Inclusion:

Clinical studies – including randomised, prospective, or retrospective

Full text version available

Published in English

Published in peer-reviewed journal

Non-weight bearing status < 6 weeks

Exclusion:

Cadaveric studies

Animal studies

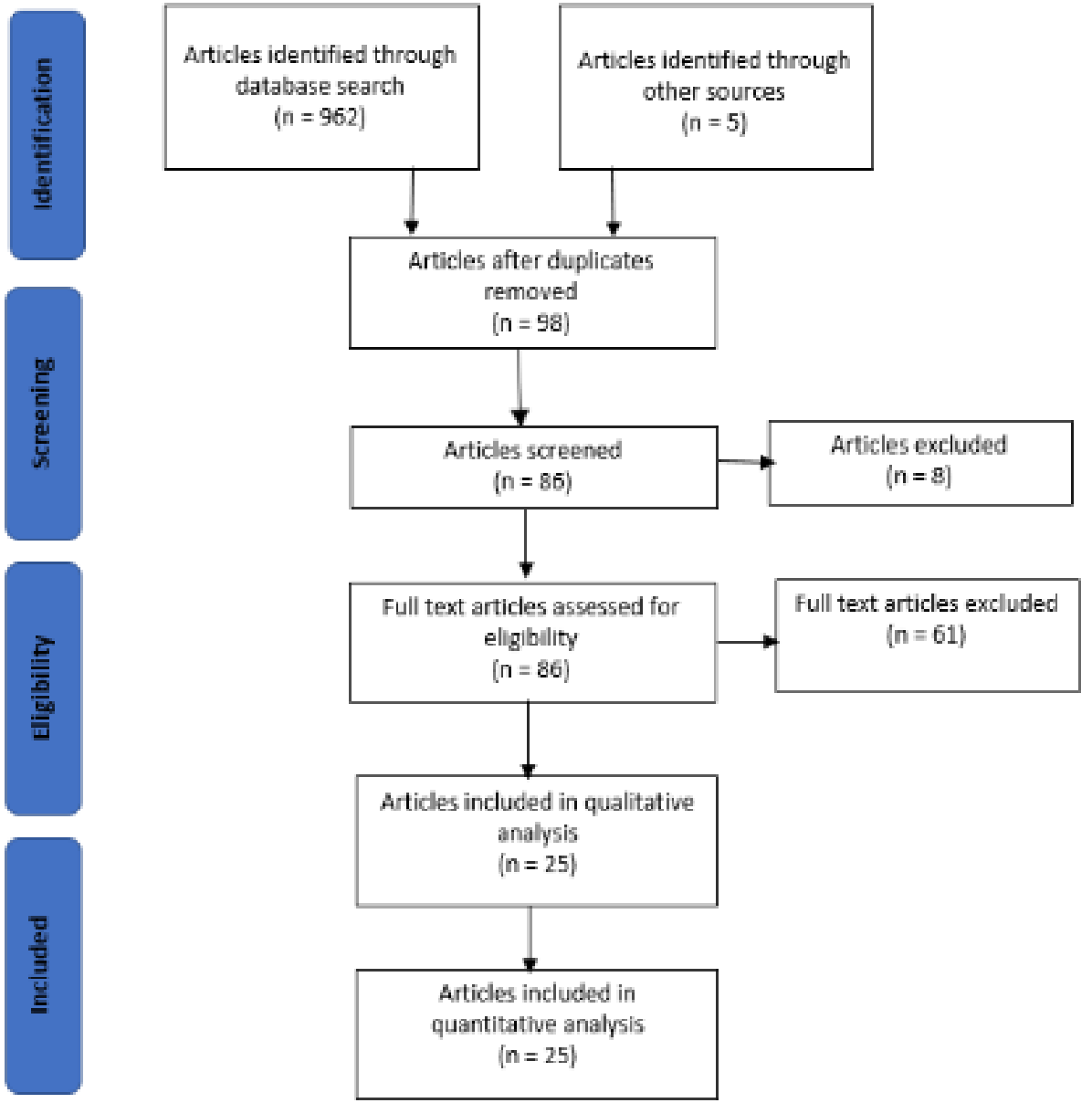
Case reports

Inadequate description of surgical technique

Inadequate description of post-operative weight bearing regime

Non-weight bearing status > 6 weeks

Flowchart:


Identification
Screening
Eligibility
Included
Articles identified through database search (n = 962)
Articles identified through other sources (n = 5)
Articles after duplicates removed (n = 98)
Articles screened (n = 86)
Articles excluded (n = 8)
Full text articles assessed for eligibility (n = 86)
Full text articles excluded (n = 61)
Articles included in qualitative analysis (n = 25)
Articles included in quantitative analysis (n = 25)

Coleman methodology score:

Part A: Only one score to be given for each of the seven sections	
Study size – number of patients	
<30	0
30-50	4
51-100	7
>100	10
Mean Follow-up	
<12 months	0
12-36 months	4
37-60 months	7
>61 months	10
Surgical approach	
Different approach used and outcome not reported separately	0
Different approaches used and outcome reported separately	7
Single approach used	10
Type of study	
Retrospective cohort study	0
Prospective cohort study	7
Randomised control trial	10
Description of diagnosis	
Described without % specified	0
Described with % specified	5
Descriptions of surgical technique	
Inadequate (not stated, unclear	0
Fair (technique only stated	5
Adequate (technique stated, details of surgical procedure given	10
Description of postoperative rehabilitation	
Described	5
Not described	0
Part B: Scores may be given for each option in each of the three sections if applicable	
Outcome criteria	
Outcome measures clearly described	2
Timing of outcome measure clearly stated	2
Use of outcome criteria that has reported reliability	3
General health measure included	3

Procedure of assessing outcomes	
Subjects recruited	5
Investigator independent of surgeon	4
Written assessment	3
Completion of assessment by patients themselves with minimal investigator assistance	3
Description of subject selection process	
Selection criteria reported and unbiased	5
Recruitment rate reported	
>90%	5
<90%	0

CMS

Study	Coleman Methodology Score										
	Part A							Part B			Total
	1	2	3	4	5	6	7	1	2	3	
Scheele *et al.* (2023)	7	4	7	0	5	10	5	2230	0000	505	55
Niehaus *et al.* (2022)	0	4	10	0	5	10	5	2233	5033	000	55
Liu *et al.* (2022)	10	4	10	7	5	10	5	2233	5433	005	**81**
Manchanda *et al.* (2021)	7	7	10	0	5	5	5	2233	0000	000	49
Brissey *et al.* (2021)	4	4	10	0	5	10	5	2200	0000	000	42
Langan *et al.* (2020)	7	0	10	0	5	10	5	2200	0000	000	41
Mayet *et al.* (2019)	7	4	10	0	5	10	5	2200	0000	000	45
Ray *et al.* (2019)	7	4	10	5	10	5	5	2200	5400	000	59
Peterson *et al.* (2016)	10	7	10	0	5	10	5	2200	0000	000	51
Chopra *et al.* (2016)	0	0	10	0	0	5	0	2200	0030	050	27
Prissel *et al.* (2016)	10	0	0	0	0	0	0	2000	0000	000	**12**
King *et al.* (2015)	10	4	10	0	5	10	0	2200	0400	000	47
Zelent *et al.* (2015)	4	4	7	0	0	10	5	2200	0000	050	39
Guttek *et al.* (2015)	4	4	10	7	5	10	5	2230	5030	000	60
McAlister *et al.* (2014)	7	0	10	0	5	10	5	2200	0000	000	41
Klos *et al.* (2013)	7	4	10	7	5	10	5	2230	0000	005	60
Cottom & Vora (2013)	7	4	10	0	0	10	5	2230	0000	000	43
Ellington *et al.* (2011)	4	4	10	0	0	10	5	2200	0030	000	40
Menke *et al.* (2011)	0	7	10	0	0	10	5	2211	0000	000	38
Basile *et al.* 2010)	4	0	7	0	5	10	5	2200	0000	000	35
Blitz *et al.* (2010)	7	0	7	0	10	5	5	2200	0000	000	38
Sorensen *et al.* (2009)	0	0	10	0	0	10	5	2200	5000	000	34
Kazza & Singh (2009)	0	4	10	5	10	5	5	2200	0000	000	43
Saxena *et al.* (2009)	4	7	7	0	0	10	5	2200	0030	000	40
Coetzee & Wickham (2004)	10	7	10	7	5	10	5	2200	0030	000	61

Early Weightbearing After Arthrodesis of the First Metatarsal-Medial Cuneiform Joint: A Systematic Review of the Incidence of Non-union (2018).

- Incidence rate of non-union in early weight bearing studies (<2 weeks).
- The authors do not provide a justification for their strict inclusion criteria of <2 week early weight bearing regime, although it would initiatively suggest a safe time period for wound healing.
- Eight studies met their inclusion criteria with 443 first MCJ arthrodesis procedures analysed reporting an incident rate of 3.16% (16 cases).