

Supplementary article data

Operative and nonoperative treatment of clavicle fractures in adults

A systematic review of 1,190 patients from the literature

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Submitted 11-01-25. Accepted 11-07-11

Appendix. Information retrieval and strategy to localize candidate trials

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1 fractures, bone/ or fractures, closed/ or fractures, comminuted/
  or fractures, compression/ or fractures, malunited/ or fractures,
  open/ or fractures, spontaneous/ or fractures, ununited/ (42617)
2 exp Fracture Fixation/ (31152)
3 Fracture Healing/ (4347)
4 Clavicle/ (2833)
5 (clavic$ or (collar adj2 bone$)).ti,ab. (4029)
6 (fract$ or broken or break$).ti,ab. (451475)
7 1 or 2 or 3 (63904)
8 4 and 7 (963)
9 5 and 6 (1036)
10 8 or 9 (1424)
11 exp Controlled Clinical Trials/ (43438)
12 clinical trial.pt. (421236)
13 ((control$ adj5 trial$) or (contr$ adj3 stud$)).ti,ab. (175805)
14 (random$ or rct?).mp. [mp=title, original title, abstract, name of
  substance word, subject heading word] (438045)
15 control groups/ or cross-over studies/ or double-blind method/ or
  single-blind method/ (103564)
16 11 or 12 or 13 or 14 or 15 (740095)
17 10 and 16 (48)
18 (consensus or guideline$).mp. (168501)
19 National Health Programs/ (14023)
20 18 or 19 (181713)
21 10 and 20 (8)
22 exp Longitudinal Studies/ (512951)
23 (follow up or follow?up or prospect$).ti,ab. (498907)
24 22 or 23 (753141)
25 10 and 24 (264)
26 (systemat$ adj2 review$).ti,ab. (9244)
27 meta-analysis/ (6422)
28 meta-analy$.ti,ab. (14040)
29 meta-analysis.pt. (12027)
30 metaregressi$.mp. [mp=title, original title, abstract, name of
  substance word, subject heading word] (43)
31 review.pt. (1157935)
32 evidence-based medicine/ (19222)
33 26 or 27 or 28 or 29 or 30 or 31 or 32 (1186377)
34 10 and 33 (110)
35 17 or 21 or 25 or 34 (400)
36 from 35 keep 1-200 (200)

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Table 3. Effectiveness of the included studies (n=13) in the systematic review of clavicle fractures.

Author, year, country	Primary outcome measure	Secondary outcome measures	Complications	Union	Nonunion
Hoofwijk 1988 Netherlands	Pain: VAS ^(a) (p>0.05) Rucksack bandage: 1. day: 5.3 8. day: 3.3 15. day: 2.6 Mitella: 1. day: 5.3 8. day: 3.0 15. day: 1.8	Need for analgesic medication (p>0.05) Rucksack bandage: 4.2 days Mitella: 3.6 days Return to work (p>0.05) Rucksack bandage: 3.6 weeks Mitella: 3.5 weeks Return to sports (p>0.05) Rucksack bandage: 5.0 weeks Mitella: 5.6 weeks Union: clinical evaluation (p>0.05) Rucksack bandage: 3.8 weeks Mitella: 3.6 weeks Function: mobility of shoulder joint at 10 months (p>0.05) Rucksack bandage: good 73/74 Mitella: good 77/78 Muscular strength Results not reported	Rucksack bandage Delayed union: 1 Nonunion: 4 Mitella Secundary plexus irritation: 1 Total Rucksack bandage: 5/74 Mitella: 1/78	Rucksack bandage: 3.8 weeks Mitella: 3.6 weeks	Rucksack bandage: 4/74 Mitella: 0/78
Canadian Orthopaedic Trauma Society 2007 Canada	Function: DASH ⁽¹⁾ at 6 weeks (p<0.01) Plate: 22 Sling: 40 at 3 months (p=0.04) Plate: 15 Sling: 22 at 1 year (p<0.01) Plate: 5 Sling: 15	Function: CS ⁽¹⁾ at 6 weeks (p<0.01) Plate: 80 Sling: 69 at 3 months (p<0.01) Plate: 90 Sling: 83 at 1 year (p<0.01) Plate: 96 Sling: 90 Union: X-ray (p=0.001) Plate: 16.4 weeks Sling: 28.4 weeks Complications: (p=0.008) Plate: 23/62 Sling: 31/49	Plate Nonunion: 2 Wound infection: 3 Hardware irritation requiring removal: 5 Transient brachial plexus symptoms: 8 Abnormality in AC/STC joint: 2 Early mechanical failure: 1 Other: 2 Sling Nonunion: 7 Malunion requiring treatment: 9 CRPS: 1 Surgery for impending open fracture: 2 Transient brachial plexus symptoms: 7 Abnormality in AC/STC joint: 3 Other: 2 Total (p=0.008) Plate: 23/62 Sling: 31/49	Plate: 16.4 weeks Sling: 28.4 weeks (p=0.001)	Plate: 2/62 Sling: 7/49 (p=0.042)
Shen 2008 China	Union: X-ray at 4 months ^(a) 3D plate: 63/67 Superior plate: 43/66	ROM: results not reported Strength: results not reported Symptoms beyond 16 weeks (p=0.015) 3D plate: 3/66	3D plate Delayed union: 1 Superior plate Delayed union: 8	3D plate: 66/66 Superior plate: 58/58	3D plate: 0/66 Superior plate: 0/58

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<p>Judd 2009 United States</p>	<p>Function: SANE ^(a) at 6 weeks (p>0.05) Hagie pin: 65.9 Sling: 56.1 at 3 months (p>0.05) Hagie pin: 78.5 Sling: 70.7 at 1 year (p>0.05) Hagie pin: 93.5 Sling: 97.0</p>	<p>Superior plate: 15/58 Delayed union X-ray at 4 months (p=0.018) 3D plate: 1/66 Superior plate: 8/58 Operation time (p=0.334): results not reported Hospital stay (p=0.361): results not reported Function: L'Insalata at 6 weeks (p>0.05) Hagie pin: 61.3 Sling: 51.6 at 3 months (p>0.05) Hagie pin: 73.5 Sling: 66.4 at 1 year (p>0.05) Hagie pin: 95.5 Sling: 97.9 Union: X-ray (p>0.05) Hagie pin: 26/29 Sling: 22/28</p>	<p>Clavicular shortening: X-ray ESIN: 3.5% (p<0.05) Sling: 5.1% (p=0.68) Function: DASH at 2 years (p=0.03) ESIN: 0.5 Sling: 3.1 CS at 2 years (p=0.02) ESIN: 98.0 Sling: 95.1 Complications (p=0.55) ESIN: 18/60 Sling: 20/52</p>	<p>Superior plate: 15/58 Delayed union X-ray at 4 months (p=0.018) 3D plate: 1/66 Superior plate: 8/58 Operation time (p=0.334): results not reported Hospital stay (p=0.361): results not reported Function: L'Insalata at 6 weeks (p>0.05) Hagie pin: 61.3 Sling: 51.6 at 3 months (p>0.05) Hagie pin: 73.5 Sling: 66.4 at 1 year (p>0.05) Hagie pin: 95.5 Sling: 97.9 Union: X-ray (p>0.05) Hagie pin: 26/29 Sling: 22/28</p>	<p>ESIN: 3.5% (p<0.05) Sling: 5.1% (p=0.68) Function: DASH at 2 years (p=0.03) ESIN: 0.5 Sling: 3.1 CS at 2 years (p=0.02) ESIN: 98.0 Sling: 95.1 Complications (p=0.55) ESIN: 18/60 Sling: 20/52</p>	<p>Function: CS at 1 year (p=0.365) Rockwood pin: 92.1 Plate: 88.7</p>	<p>Clavicular shortening: X-ray ESIN: 3.5% (p<0.05) Sling: 5.1% (p=0.68) Function: DASH at 2 years (p=0.03) ESIN: 0.5 Sling: 3.1 CS at 2 years (p=0.02) ESIN: 98.0 Sling: 95.1 Complications (p=0.55) ESIN: 18/60 Sling: 20/52</p>	<p>Superior plate: 15/58 Delayed union X-ray at 4 months (p=0.018) 3D plate: 1/66 Superior plate: 8/58 Operation time (p=0.334): results not reported Hospital stay (p=0.361): results not reported Function: L'Insalata at 6 weeks (p>0.05) Hagie pin: 61.3 Sling: 51.6 at 3 months (p>0.05) Hagie pin: 73.5 Sling: 66.4 at 1 year (p>0.05) Hagie pin: 95.5 Sling: 97.9 Union: X-ray (p>0.05) Hagie pin: 26/29 Sling: 22/28</p>	<p>ESIN: 3.5% (p<0.05) Sling: 5.1% (p=0.68) Function: DASH at 2 years (p=0.03) ESIN: 0.5 Sling: 3.1 CS at 2 years (p=0.02) ESIN: 98.0 Sling: 95.1 Complications (p=0.55) ESIN: 18/60 Sling: 20/52</p>	<p>Function: CS at 1 year (p=0.365) Rockwood pin: 92.1 Plate: 88.7</p>	<p>ESIN: 3.5% (p<0.05) Sling: 5.1% (p=0.68) Function: DASH at 2 years (p=0.03) ESIN: 0.5 Sling: 3.1 CS at 2 years (p=0.02) ESIN: 98.0 Sling: 95.1 Complications (p=0.55) ESIN: 18/60 Sling: 20/52</p>
<p>Smekal 2009, Smekal 2011 Austria ^(*)</p>	<p>Time to union: X-ray ^(a) (p=0.01) ESIN: 11.9 weeks Sling: 16.6 weeks</p>	<p>Clavicular shortening: X-ray ESIN: 3.5% (p<0.05) Sling: 5.1% (p=0.68) Function: DASH at 2 years (p=0.03) ESIN: 0.5 Sling: 3.1 CS at 2 years (p=0.02) ESIN: 98.0 Sling: 95.1 Complications (p=0.55) ESIN: 18/60 Sling: 20/52</p>	<p>Clavicular shortening: X-ray ESIN: 3.5% (p<0.05) Sling: 5.1% (p=0.68) Function: DASH at 2 years (p=0.03) ESIN: 0.5 Sling: 3.1 CS at 2 years (p=0.02) ESIN: 98.0 Sling: 95.1 Complications (p=0.55) ESIN: 18/60 Sling: 20/52</p>	<p>Clavicular shortening: X-ray ESIN: 3.5% (p<0.05) Sling: 5.1% (p=0.68) Function: DASH at 2 years (p=0.03) ESIN: 0.5 Sling: 3.1 CS at 2 years (p=0.02) ESIN: 98.0 Sling: 95.1 Complications (p=0.55) ESIN: 18/60 Sling: 20/52</p>	<p>Clavicular shortening: X-ray ESIN: 3.5% (p<0.05) Sling: 5.1% (p=0.68) Function: DASH at 2 years (p=0.03) ESIN: 0.5 Sling: 3.1 CS at 2 years (p=0.02) ESIN: 98.0 Sling: 95.1 Complications (p=0.55) ESIN: 18/60 Sling: 20/52</p>	<p>Clavicular shortening: X-ray ESIN: 3.5% (p<0.05) Sling: 5.1% (p=0.68) Function: DASH at 2 years (p=0.03) ESIN: 0.5 Sling: 3.1 CS at 2 years (p=0.02) ESIN: 98.0 Sling: 95.1 Complications (p=0.55) ESIN: 18/60 Sling: 20/52</p>	<p>Clavicular shortening: X-ray ESIN: 3.5% (p<0.05) Sling: 5.1% (p=0.68) Function: DASH at 2 years (p=0.03) ESIN: 0.5 Sling: 3.1 CS at 2 years (p=0.02) ESIN: 98.0 Sling: 95.1 Complications (p=0.55) ESIN: 18/60 Sling: 20/52</p>	<p>Clavicular shortening: X-ray ESIN: 3.5% (p<0.05) Sling: 5.1% (p=0.68) Function: DASH at 2 years (p=0.03) ESIN: 0.5 Sling: 3.1 CS at 2 years (p=0.02) ESIN: 98.0 Sling: 95.1 Complications (p=0.55) ESIN: 18/60 Sling: 20/52</p>	<p>Clavicular shortening: X-ray ESIN: 3.5% (p<0.05) Sling: 5.1% (p=0.68) Function: DASH at 2 years (p=0.03) ESIN: 0.5 Sling: 3.1 CS at 2 years (p=0.02) ESIN: 98.0 Sling: 95.1 Complications (p=0.55) ESIN: 18/60 Sling: 20/52</p>	<p>Clavicular shortening: X-ray ESIN: 3.5% (p<0.05) Sling: 5.1% (p=0.68) Function: DASH at 2 years (p=0.03) ESIN: 0.5 Sling: 3.1 CS at 2 years (p=0.02) ESIN: 98.0 Sling: 95.1 Complications (p=0.55) ESIN: 18/60 Sling: 20/52</p>	
<p>Ferran 2010 United Kingdom</p>	<p>Function: CS at 1 year (p=0.365) Rockwood pin: 92.1 Plate: 88.7</p>	<p>Function: Oxford shoulder score at 1 year (p=0.773) Rockwood pin: 45.2 Plate: 44.7 Union: X-ray Rockwood pin: 17/17 Plate: 15/15 Complications: Rockwood pin: 4/17 Plate: 4/15</p>	<p>Function: Oxford shoulder score at 1 year (p=0.773) Rockwood pin: 45.2 Plate: 44.7 Union: X-ray Rockwood pin: 17/17 Plate: 15/15 Complications: Rockwood pin: 4/17 Plate: 4/15</p>	<p>Function: Oxford shoulder score at 1 year (p=0.773) Rockwood pin: 45.2 Plate: 44.7 Union: X-ray Rockwood pin: 17/17 Plate: 15/15 Complications: Rockwood pin: 4/17 Plate: 4/15</p>	<p>Function: Oxford shoulder score at 1 year (p=0.773) Rockwood pin: 45.2 Plate: 44.7 Union: X-ray Rockwood pin: 17/17 Plate: 15/15 Complications: Rockwood pin: 4/17 Plate: 4/15</p>	<p>Function: Oxford shoulder score at 1 year (p=0.773) Rockwood pin: 45.2 Plate: 44.7 Union: X-ray Rockwood pin: 17/17 Plate: 15/15 Complications: Rockwood pin: 4/17 Plate: 4/15</p>	<p>Function: Oxford shoulder score at 1 year (p=0.773) Rockwood pin: 45.2 Plate: 44.7 Union: X-ray Rockwood pin: 17/17 Plate: 15/15 Complications: Rockwood pin: 4/17 Plate: 4/15</p>	<p>Function: Oxford shoulder score at 1 year (p=0.773) Rockwood pin: 45.2 Plate: 44.7 Union: X-ray Rockwood pin: 17/17 Plate: 15/15 Complications: Rockwood pin: 4/17 Plate: 4/15</p>	<p>Function: Oxford shoulder score at 1 year (p=0.773) Rockwood pin: 45.2 Plate: 44.7 Union: X-ray Rockwood pin: 17/17 Plate: 15/15 Complications: Rockwood pin: 4/17 Plate: 4/15</p>		

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<p>Jubel 2005 Germany</p>	<p>Pain: VAS ^(a)(¹) at 3 days (p<0.05) ESIN: 31 Rucksack bandage: 72 at 7 days (p<0.05) ESIN: 28 Rucksack bandage: 63 at 2 weeks (p<0.05) ESIN: 15 Rucksack bandage: 52 at 3 weeks (p<0.05) ESIN: 15 Rucksack bandage: 45 at 4 weeks (p<0.05) ESIN: 8 Rucksack bandage: 29 at 3 months (p<0.05) ESIN: 4 Rucksack bandage: 15 at 6 months (p<0.05) ESIN: 1 Rucksack bandage: 14</p>	<p>Satisfaction: 1-6 ⁽¹⁾ (p<0.001) ESIN: 1.1 Rucksack bandage: 2.0 Duration of sick leave: days (p<0.001) ESIN: 16 ±12 Rucksack bandage: 40 ±19 Function: CS at 6 months ⁽¹⁾ (p<0.001) ESIN: 98 Rucksack bandage: 90 Shortening of clavicle: cm (p<0.001) ESIN: 0.2 ±0.3 Rucksack bandage: 1.4 ±0.9 ROM: Abduction at 6 months ⁽¹⁾ (p<0.05) ESIN: 175° Rucksack bandage: 165° Function: DASH at 6 months ⁽¹⁾ (p<0.001) ESIN: 2 Rucksack bandage: 10 Complications ESIN: 14/26 Rucksack bandage: 21/27</p>	<p>ESIN Paresthesia of ipsilateral arm: 1 Pain in the medial end of nail: 7 Lateral perforation of nail: 2 Shortening of nail tip: 2 Early removal of nail: 2 Rucksack bandage Paresthesia of ipsilateral arm: 4 Painfull skin lesion in axilla: 9 Swelling and syanose of ipsilateral arm: 4 Loss of reposition: 2 Nonunion: 2 Total ESIN: 14/26 Rucksack bandage: 21/27</p>	<p>ESIN: 26/26 Rucksack bandage: 25/27</p>	<p>ESIN: 0/26 Rucksack bandage: 2/27</p>
<p>Lee 2007 Taiwan</p>	<p>Union: X-ray at 6 months ^(a) (p=0.48) Knowles pin: 32/32 Plate: 29/30</p>	<p>Function: CS at 30 months (p=0.7) Knowles pin: 85 Plate: 84 Operative time: minutes (p<0.001) Knowles pin: 36 Plate: 64 Incision length: cm (p=0.001) Knowles pin: 4.2 Plate: 7.8 Hospital stay: days (p=0.03) Knowles pin: 6.2 Plate: 9.1</p>	<p>Knowles pin Hardware irritation: 4 Plate Nonunion: 1 Wound infection: 1 Implant failures: 2 Hardware irritation: 12 Total (p=0.04) Knowles pin: 4/32 Plate: 16/30</p>	<p>Knowles pin: 32/32 Plate: 29/30</p>	<p>Knowles pin: 0/32 Plate: 1/30 (p=0.48)</p>
<p>Lee 2008 Taiwan</p>	<p>Union: X-ray at 6 months ^(a) (p=0.36) Knowles pin: 56/56 Plate: 31/32</p>	<p>Operative time: minutes (p<0.001) Knowles pin: 27.5 Plate: 68.4 Pain: VAS Results not reported Function: CS (p=0.84) Knowles pin: 95.3 Plate: 93.1 Incision length: cm (p<0.001) Knowles pin: 4.1 Plate: 8.4</p>	<p>Knowles pin Hardware irritation: 4 Plate Nonunion: 1 Hardware irritation: 12 Wound infection: 1 Implant failure: 1 Total (p=0.045) Knowles pin: 4/56 Plate: 15/32</p>	<p>Knowles pin: 56/56 Plate: 31/32 (p=0.36)</p>	<p>Knowles pin: 0/56 Plate: 1/32</p>

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<p>Pai 2009 Taiwan</p>	<p>Union: X-ray at 6 months^(a) (p=1.0) LCP: 28/29 NLP: 34/35</p>	<p>Pain: VAS prep. - 3. day postop. (p=0.91) LCP: 6.7 - 2.1 NLP: 6.5 - 2.2 Function: CS at 1 year (p=0.54) LCP: 91.6 NLP: 89.1</p>	<p>LCP Nonunion: 1 Symptomatic hardware: 11 NLP Nonunion: 1 Plate loosening: 4 Wound infection: 1 Symptomatic hardware: 14 Total (p=0.087) LCP: 12/29 NLP: 20/35</p>	<p>LCP: 28/29 NLP: 34/35 (p=1.0)</p>	<p>LCP: 1/29 NLP: 1/35</p>
<p>Hsu 2010 Taiwan</p>	<p>Union: X-ray^(a) Hook plate: 14.2 weeks Tension band: 13.8 weeks</p>	<p>Function: ROM at 6 months Elevation (p=0.006) Hook plate: 160° Tension band: 165° Abduction (p=0.004) Hook plate: 165° Tension band: 168° External rotation (p=0.396) Hook plate: 80° 4/35, 85° 18/35, 90° 13/35 Tension band: 85° 18/30, 90° 11/30, 95° 1/30 Function: Oxford shoulder score at 6 months (p=0.072) Hook plate: 21 Tension band: 18</p>	<p>Hook plate Subacromial erosion: 9 Tension band K-wire migration: 5 Total Hook plate: 9/35 Tension band: 5/30</p>	<p>Hook plate: 14.2 weeks Tension band: 13.8 weeks</p>	<p>Hook plate: 0/35 Tension band: 0/30</p>
<p>Böhme 2011 Germany</p>	<p>Pain: VAS (0-15)^(a) (p=0.316) Results not reported</p>	<p>Cosmetics (p=0.48) Results not reported Union Results not reported Function: CS at 8 months (p=0.01) Rucksack bandage: 90.3 Plate: 94.4 ESIN: 96.7 Complications Rucksack bandage: 7/47 Plate: 7/53 ESIN: 3/20</p>	<p>Rucksack bandage Deep vein thrombosis: 1 Malunion: 1 Skin tightening: 1 Nonunion: 1 Intolerable pain: 2 Delayed union: 1 Plate Wound healing problem: 1 Wound infection: 2 Plate bending: 3 Plate breakage: 1 ESIN Plexus irritation: 1 Wound healing problem: 1 Nail breakage: 1 Total Rucksack bandage: 7/47 Plate: 7/53 ESIN: 3/20</p>	<p>Rucksack bandage: 46/47 Plate: 53/53 ESIN: 20/20</p>	<p>Rucksack bandage: 1/47 Plate: 0/53 ESIN: 0/20</p>
<p>Kulhreshtha 2011</p>	<p>Union: X-ray at 6 months</p>	<p>Function: CS at 18 months (p<0.0001)</p>	<p>Plate</p>	<p>Plate: 45/45</p>	<p>Plate: 0/45</p>

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<p>India</p>	<p>(p=0.002) Plate: 45/45 Sling: 20/28</p>	<p>Only difference (5/8) between groups reported Complications Plate: 12/45 Sling: 26/28</p>	<p>Implant failure: 2 Delayed union: 2 Reoperation: 2 Symptomatic malunion: 2 Implant irritation and removal: 4 Sling Nonunion: 8 Symptomatic malunion: 10 Surgery for nonunion/malunion: 8 Total Plate: 12/45 Sling: 26/28</p>	<p>Sling: 20/28</p>	<p>Sling: 8/28</p>
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(a) Primary outcome was not specified in the study. Selected primary outcome is the first mentioned in Materials and Methods –section. If outcomes were not mentioned in Materials and Methods – section, the selected primary outcome is the first mentioned in Results-section.

(1) Values estimated from diagram.

(*) Studies are assessed to originate partly from the same patient population. Results are from the recent (2011) study.

Abbreviations:

- VAS= Visual Analogue Scale
- DASH= Disabilities of the Arm, Shoulder and Hand score
- CS= Constant Shoulder Score
- AC= Acromioclavicular
- STC= Sternoclavicular
- CRPS= Complex Regional Pain Syndrome
- 3D= Three-dimensional
- SANE= Single Assessment Numeric Evaluation
- ESIN= Elastic Stable IntraMedullary Nail
- ROM= Range Of Motion
- LCP= Locking Compression Plate
- NLP= Non-Locking Plate