Figure 2. Participant flow (Kabak 2004)

Kabak 2004
Assessed for eligibility
42 non-union of the clavicle
Mar 1996 – Jul 2004

Excluded (n = 6)
• 6 participants refused the treatment protocol

Randomised
36 participants (non-union)

3 participants lost to follow-up

Allocated
3.5mm AO LC-DCP
n = 17
age (mean/range/SD): 42.7/21–66/11.4
gender (male/female): 9/8

Follow-up (18 – 72 months)
Mean = 44.2 months

Analysed
n = 17
Classification
Atrophic non-union (13)
Hypertrophic non-union (4)

Allocated
3.5mm AO DCP
n = 16
age (mean/range/SD): 40.0/19–59/11.9
gender (male/female): 10/6

Follow-up (18 – 72 months)
Mean = 44.2 months

Analysed
n = 16
Classification
Atrophic non-union (12)
Hypertrophic non-union (4)
Figure 3. Participant flow (Lee 2007)

Lee 2007
Assessed for eligibility
152 clavicle fractures
1999 – 2002

Excluded (n = 83)
Conservative treatment

Randomised
69 participants (fractures)

Allocated

Knowles pin
n = not mentioned

Follow-up 30 months

Analysed
n = 32
age (mean/range): 60.4/50-81
gender (male/female): 19/13
Classification*
Open fractures
  • Gustilo type I: 0
  • Gustilo type II: 1
Transverse fractures: 6
Oblique & spiral fractures: 18
Comminuted fractures: 5
Symptomatic non-union: 1

Allocation

Plate
n = not mentioned

Follow-up 30 months

Analysed
n = 30
age (mean/range): 56.7/52-79
gender (male/female): 17/13
Classification*
Open fractures
  • Gustilo type I: 1
  • Gustilo type II: 1
Transverse fractures: 5
Oblique & spiral fractures: 17
Comminuted fractures: 5
Symptomatic non-union: 2

* The numbers of participants do not match with the numbers of classified fractures.
Figure 4. Participant flow (Shen 2008)

Assessed for eligibility
150 clavicle fractures
2003 – 2006

Excluded (n = 17)
Not meet the criteria of enrolment

Randomised
133 participants (fractures)

Allocated
3D plate
n = 67
age (mean/range): 43.8 / 26 to 60
gender (male/female): 39 / 28
side (left/right): 13 / 54
Type of fracture
comminuted: 51
spiral: 16

Follow-up 12 months
4 lost to follow-up
Not attend the follow-up: 3
Re-operation: 1

Analysed
n = 63

Allocated
Superior plate
n = 66
age (mean/range): 44.7 / 18 to 51
gender (male/female): 36 / 30
side (left/right): 43 / 23
Type of fracture
comminuted: 45
spiral: 21

Follow-up 12 months
12 lost to follow-up
Not attend the follow-up: 4
Re-operation: 8

Analysed
n = 54
Setting
The three trials were conducted in hospitals located in one of three countries: China (Shen 2008), Taiwan (Lee 2007) and Turkey (Kabak 2004).

Participants
Age and gender
Age was not specified in the inclusion criteria of Kabak 2004. Lee 2007 stipulated a lower age limit of 50 years. Shen 2008 excluded participants who were under 18 years of age or over 60 years. The mean ages of the trial populations were: 41 years in Kabak 2004; 44 years in Shen 2008; and 59 years in Lee 2007. Kabak 2004 and Lee 2007 reported that 58% of trial participants were male; and in Shen 2008 56% were male.

Types of fractures and non-union
Kabak 2004 included only participants with non-union of the middle third of the clavicle (as early as six months after the initial fracture). Lee 2007 included participants with either acute fractures or non-union. Participants in Shen 2008 had sustained a recent acute, displaced, middle third clavicle fracture.

In Kabak 2004, non-union was classified into two groups: atrophic, when there was little or no visible callus and hypertrophic with excessive callus. In Lee 2007, fracture patterns were divided into: open fractures, transverse fractures, oblique and spiral fractures, comminuted fractures, and symptomatic non-union. Shen 2008 classified the acute dislocated fractures as comminuted and spiral.

Interventions
The included trials allowed three comparisons to be made. These comparisons were as follows:
Comparison 1: a low-contact dynamic compression plate (LC-DCP) versus a dynamic compression plate (DCP) for treating non-union of the middle third of the clavicle (Kabak 2004).
Comparison 2: Knowles pin versus a dynamic compression plate for treating middle third clavicle fractures and non-union (Lee 2007).
Comparison 3: a three-dimensional plate versus a superior-positioned plate for treating acute dislocated middle third clavicle fractures (Shen 2008). This trial compared two techniques of fixation.

In one group, the plate was positioned three-dimensionally and fixed superiorly on the main distal fragment and anteriorly on the main proximal fragments. In the other group the plate was shaped in the form of an ‘S’ and fixed on the superior surface.

Outcome measures
Primary outcomes
• Presence of pain was reported by Kabak 2004: post-operative pain was evaluated in Lee 2007.
• Treatment failure (re-operation) was reported in all trials.

Secondary outcomes
• Functional impairment and clinical outcomes were appraised by all trials
Kabak 2004 evaluated the endpoint ‘time to return to work’ and numbers of participants with limited range of motion: Lee 2007 quantified wound size: Shen 2008 assessed the endpoint ‘symptomatic patients’, which was defined as physical examination with local signs and symptoms that included two of the following four: pain at rest, pain during activity, strength reduction, and shoulder elevation < 120°.
• Radiographic outcomes were assessed by all trials
Kabak 2004 measured the time to clinical and radiographic union:
Lee 2007 evaluated union rates in six months; Shen 2008 measured the number of delayed unions (defined as non-presence of bridging callus in one of the two cortices as seen on an antero-posterior view, or 45° cephalic tilt view after > 16 weeks, and physical examination with local signs and symptoms of patients who later became symptomatic), and radiographic healing of the fracture.
• Adverse outcomes were evaluated by two trials (Kabak 2004; Lee 2007)
Kabak 2004 reported complications and plate removals; Lee 2007 assessed the endpoints ‘symptomatic hardware’, ‘hardware removal’, and ‘wound infection’.
• Economic data were reported in two trials (Lee 2007; Shen 2008)
Both Lee 2007 and Shen 2008 reported length of hospital stay.

Excluded studies
Five studies were excluded because they were neither randomised nor quasi-randomised trials; see the Characteristics of excluded studies.

Ongoing studies
Our search found no ongoing studies.

Risk of bias in included studies
Table 2 shows the results for each of the three trials for the 11 items of the Cochrane Bone, Joint and Muscle Trauma Group’s former quality assessment tool (Table 1). The first seven items of this tool relate to bias (internal validity), and the remaining four items relate to external validity and outcome measurement. Details of the method of randomisation, assessor blinding, intention-to-treat analysis, loss to follow-up, and length of follow-up are presented in the Characteristics of included studies. A summary of the results and impressions of the likelihood of bias are presented below.
Table 2. Methodological quality assessment results for individual trials

<table>
<thead>
<tr>
<th>Items / Trials</th>
<th>Kabak 2004</th>
<th>Lee 2007</th>
<th>Shen 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Allocation concealment</td>
<td>Unclear</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>2. Intention-to-treat analysis</td>
<td>No</td>
<td>No</td>
<td>Unclear</td>
</tr>
<tr>
<td>3. Assessor blinding</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>4. Baseline characteristics comparability</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Yes</td>
</tr>
<tr>
<td>5. Participant blinding</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>6. Treatment provider blinding</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>7. Care programme comparability</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>8. Inclusion and exclusion criteria</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>9. Well defined outcome measures</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Yes</td>
</tr>
<tr>
<td>10. Clinically useful diagnostic tests</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>11. Adequate duration of follow-up</td>
<td>Yes</td>
<td>Yes</td>
<td>Unclear</td>
</tr>
</tbody>
</table>

**Allocation concealment (item 1)**

Only Shen 2008 described adequate methods of randomisation and concealment of allocation. Kabak 2004 used computer-based randomisation but gave insufficient details to ascertain whether allocation was concealed. Lee 2007 was quasi-randomised based on alternation, and thus there was no concealment of allocation.

**Intention-to-treat analysis and handling of withdrawals/losses to follow-up (item 2)**

All three trials described withdrawals but Kabak 2004 and Lee 2007 did not mention in which groups the losses occurred. Participant flow diagrams of the data available for the three trials are presented in Figure 1, Figure 2 and Figure 3 respectively. None of the trials, however, presented outcome data for participants who had withdrawn from the trial or were lost to follow-up.

Losses to follow-up were not rated in the quality assessment tool. They were 8% in Kabak 2004, 10% in Lee 2007, and 12% in Shen 2008. In Shen 2008, the loss of participants was dissimilar (4 versus 12) in the two groups because of the exclusion of patients (1 versus 8) who had re-operations.

**Blinding of outcome assessment (item 3)**

Outcomes assessors were blinded in Shen 2008 but not in the other two trials.

**Comparability of baseline characteristics (item 4)**

Important baseline characteristics were reported and compared between the two intervention groups by all trials. However, baseline characteristics were not given for all randomised participants in both Kabak 2004 and Lee 2007.

**Blinding of participants and intervention provider (items 5 and 6)**

Only Shen 2008 blinded the participants to the intervention. Due to the type of intervention, provider blinding was not possible for any of the trials.
Care programme comparability (item 7)
All three trials described identical care programmes for rehabilitation.

External validity

Description of inclusion and exclusion criteria (item 8)
All three trials provided sufficient information on inclusion and exclusion criteria to define their trial populations.

Definitions and quality of outcome measurement (items 9 and 10)
The definition of outcome measurement was sufficiently clear to offer a good idea of what was measured in Shen 2008. In the other trials, some clinical and functional outcome measurements were not clearly defined: Kabak 2004 did not specify the endpoint definition for 'clinical and radiological'; Lee 2007 did not characterise the endpoint 'healing fracture'. The variety of schemes used, and other outcome measures reported by the trials, are evident from the inspection of the Characteristics of included studies.

Length of follow-up (item 11)
The length of overall follow-up was more than one year in two trials (Kabak 2004; Lee 2007); and between six months and one year in one trial (Shen 2008).

Summary of overall risk of bias
Altogether the lack of confirmation of allocation concealment, absence of blinding, inadequate treatment of withdrawals in Kabak 2004 and Lee 2007 point to a high risk of bias in these trials. In contrast, particularly given effective allocation concealment and blinding, Shen 2008 seemed to be at low risk of bias.

Effects of interventions
The three comparisons of surgical implants, each evaluated by one of the included trials, are presented in turn.

Comparison I: low-contact dynamic compression plate (LC-DCP) versus dynamic compression plate (DCP) for treating non-union of the middle third of the clavicle
Open reduction and internal fixation using the LC-DCP versus the DCP for treating non-union of the middle third of the clavicle was assessed in 33 patients with mid-clavicular non-union by Kabak 2004. We present only outcome data that were complete and consistently reported in the analyses. We received no response from the authors following our request for further information or data from this trial.

Pain
The presence of pain only was recorded by Kabak 2004. No participants in either group reported pain at final follow-up. However, of the three sportsmen in each group, only those of the DCP group reported mild but not restricting pain after heavy exercise at 12 months. At the same follow-up time, three other participants of this group complained of occasional pain related to changes in the weather. This resolved after implant removal.

Treatment failure
There were two treatment failures where union was not achieved in the DCP group. Union was achieved subsequently in both patients after a further operation. The difference between the two groups did not reach statistical significance (risk ratio (RR) 0.19, 95% CI 0.01 to 3.36) (see Analysis 1.1).

Patient-reported shoulder function
Patient-assessed upper-limb function was evaluated using the DASH questionnaire. Participants allocated to LC-DCP consistently reported a higher quality of life at all follow-up times (see Analysis 1.2). At 3 months, the MD was -13.90 (95% CI -17.83 to -9.97); at six months the MD was -13.20 (95% CI -16.77 to -9.63); at 12 months the MD was -8.90 (95% CI -11.73 to -6.07); and at final follow-up the MD was -8.10 (95% CI -10.73 to -5.47). The magnitude of the difference was over 10 points at three and six months, which is considered a clinically relevant difference in favour of the LC-DCP group (Gummesson 2005; Hudak 1996).

Functional impairment and clinical outcomes
All participants of the LC-DCP group returned to their original occupations, whereas two former truck drivers in the DCP group changed their jobs because of limitations in shoulder mobility. Kabak 2004 reported that the mean time to return to work was statistically significantly shorter in the LC-DCP group (6.1 versus 9.6 weeks; reported P < 0.001). Explicit mention in Kabak 2004 of mild or moderate limitation of range of motion was less common for the LC-DCP group (six versus one).

Radiographic outcomes
Two participants of the DCP group did not achieve union. The time to clinical and radiographic union was achieved significantly earlier in the LD-DCP group with a MD of -2.7 weeks (95% CI -4.09 to -1.25) (see Analysis 1.3).

Adverse outcomes
The treatment groups were not identified for the four patients with superficial infections and the patient who presented with short-term incomplete brachial palsy (resolved by four months). Significantly fewer participants in the LC-DCP group required...
plate removal (two versus eight), primarily done for cosmesis (two versus five), with a RR of 0.24 (95% CI 0.06 to 0.95: NNT 2.6) (see Analysis 1.4).

**Economic data**
No resource or cost data were available for this comparison.

**Comparison 2: Knowles pin versus a dynamic compression plate for treating middle clavicle fractures and non-union**
Lee 2007 compared open reduction and internal fixation with the Knowles pin versus the dynamic compression plate for treating middle clavicle fractures and non-union.

**Pain**
Pain, assessed using a visual analogue pain scale, and analgesic consumption were recorded for the first five days after surgery. Without providing data, Lee 2007 reported that there was no significant difference in the pain scores between the two groups on the first three postoperative days; however, results from day four and five showed lower pain scores in favour of the Knowles pin group (reported P = 0.05 and P = 0.04 respectively). Lee 2007 reported that all participants were placed on a standard protocol for analgesia, which consisted of participant-controlled meperidine, acetaminophen, and nonsteroidal anti-inflammatory drugs (NSAIDs) (including tiaprofenic acid, celecoxib, and ketoprofen). In the Knowles pin group, a statistically significantly lower total consumption over five days of meperidine (80 mg intramuscular versus 221 mg oral: reported P = 0.02) and acetaminophen (520 mg versus 1724 mg; reported P = 0.01) was evident; although the clinical significance is less clear.

**Treatment failure**
No participants in the Knowles pin group required re-operation, whereas three participants allocated to plate fixation required re-operation: for symptomatic non-union (one case), or implant failure (two cases). The difference between the two groups was not statistically significant (RR 0.13, 95% CI 0.01 to 2.49) (see Analysis 2.1).

**Shoulder function**
Lee 2007 found no difference between the two groups in the Constant and Murley scores of the affected side at 30 months post-operation (mean score (out of 100) for best function: 85 versus 84).

**Functional impairment and clinical outcomes**
Separate data for functional impairment and return to function were not available. Wound size was significantly smaller in the Knowles pin group (mean incision length: 4.2 cm versus 7.8 cm reported P < 0.001). Length of surgery was also significantly shorter in the Knowles pin group (36 min versus 64 min: reported P < 0.001).

**Radiographic outcomes**
One person in the plate group had non-union at six months (RR 0.31, 95% CI 0.01 to 7.40) (see Analysis 2.2).

**Adverse outcomes**
Adverse outcomes other than those resulting in treatment failure were: wound infection (one case which resolved after treatment), and symptomatic hardware problems. Elective removal of hardware was also reported (see Analysis 2.3). Implant-associated symptoms were significantly more common after plate fixation (4/32 versus 12/30; RR 0.31, 95% CI 0.11 to 0.86; NNT 3.57). However, elective removal of hardware did not differ significantly between the two groups (RR 0.85, 95% CI 0.60 to 1.20).

**Economic data**
Hospital stay in the Knowles pin group was on average three days shorter: mean stay 6.2 days (range 5 to 10 days) versus 9.1 days (range 5 to 15 days) (reported P = 0.03). No other resource or cost data were reported.

**Comparison 3: three-dimensional plate versus superior-positioned plate for treating acute dislocated middle third clavicle fractures**
In Shen 2008, open reduction and internal fixation involved a reconstruction plate which, after shaping, was placed either three dimensionally (3D plate) or superiorly (superior plate) onto the clavicle and fixed. Additional information and data were supplied on this trial by the lead author for length of surgery, length of hospital stay, definition of symptomatic patients, delayed union, and fracture healing.

**Pain**
Pain outcomes were not reported by Shen 2008 except within the definition of symptomatic patients (see below).

**Treatment failure**
There were significantly fewer treatment failures, defined as re-operation within four months after surgery for symptomatic non-union, in the 3D plate group (1/67 versus 8/66; RR 0.12, 95% CI 0.02 to 0.96; NNT 9.09) (see Analysis 3.1).

**Shoulder function and health-related quality of life**
Neither patient-reported functional assessment nor health-related quality of life were assessed by Shen 2008.
Functional impairment and clinical outcomes

Functional impairment and clinical outcomes were evaluated in terms of the number of symptomatic participants who had two or more of the following symptoms: pain at rest, pain during activity, strength reduction, and shoulder elevation < 120°. As shown in Analysis 3.2, there were significantly fewer symptomatic participants in the 3D plate group at both four months (3/66 vs 15/66; RR 0.20; 95% CI 0.06 to 0.65; NNT 5.55) and 12 months after surgery (RR 0.17; 95% CI 0.04 to 0.75). There was no significant difference between the two groups for length of surgery (see Analysis 3.3).

Radiographic outcomes

Significantly fewer participants allocated to 3D plate fixation failed to achieve fracture healing by four months from surgery (4/67 vs 3/36; RR 0.17; 95% CI 0.06 to 0.47) (see Analysis 3.4).

Adverse outcomes

Adverse outcomes were not explored by Shen 2008.

Economic data

There was no significant difference between the two groups in the length of hospital stay (MD 0.20 days, 95% CI -0.85 to 1.20) (see Analysis 3.5).

DISCUSSION

Summary of main results

We found only three randomised or quasi-randomised controlled trials that involved a total of 238 participants. These studies were small and the data available could not be pooled for comparison. In the operative treatment of non-union of the middle third of the clavicle the use of low-contact dynamic compression plates, when compared with a standard dynamic compression plate (one study, 36 participants), was associated with a significantly better health-related quality of life throughout the year following surgery, earlier fracture union and return to work, and a reduced incidence of implant-associated symptoms. One study (69 participants) which compared Knowles pins versus plates for treating middle third clavicle fractures and non-union found that the use of Knowles pins was associated with lower use of post-operative analgesics, reduced incidence of implant-associated symptoms, and shorter operation time and hospital stay. One study (133 participants) found that a three-dimensional technique of plate fixation was associated with a significantly lower incidence of symptomatic delayed union than a standard superior surgical approach.

Overall completeness and applicability of evidence

We included only randomised or quasi-randomised controlled trials in this review. The search strategy was developed with the aim of locating all possible relevant trials. We searched a number of electronic databases and online clinical trials registers. Efforts were made to identify unpublished trials and trials published in non-English language journals by searches of websites and contacting experts in the field. The three included trials did not allow a comprehensive review of the relative effectiveness of different methods of surgical treatment for fracture and non-union of the middle third of the clavicle. For the three comparisons for which we found eligible studies, the evidence is not robust due to the risk of bias and the small size of the included studies. All included trials assessed adults and one trial (Lee 2007) included only participants over 50 years of age. However, with the data available we could not develop subgroup analyses. Although in all three included studies the authors summarised the anatomical pattern of the fracture or non-union sustained by the participants, they did not present outcome data to allow subgroup analysis based on that information.

One limitation of our review is that some of the interventions evaluated by the included trials are unlikely to be used in current practice in many parts of the world and, moreover, many implants in current use are being superseded by a new generation of implants such as site-specific pre-contoured locking plates. The most common implants in current practice have been reported to be dynamic compression or locking plates designed for treating acute clavicle fractures and non-union (Khan 2008; Khan 2009). Reports of high rates of complications, such as migration of the implants, implant breakage, and skin breakdown at the site of nail insertion, have limited the use of intramedullary fixation (Lyons 1990; Strauss 2007). Reconstruction plates are also less accepted nowadays as they are susceptible to deformation at the fracture site, which may lead to healing complications (Khan 2009).

Quality of the evidence

The evidence base for surgically treating acute fractures or non-unions of the middle third of the clavicle is limited. Of the three included trials, two (Kahaleh 2004; Lee 2007) carried high risk of bias. Their results should be interpreted with caution and viewed, at this stage, as requiring confirmation with studies of good methodological quality and adequate power. One trial (Shen 2008) of high methodological quality found that the three-dimensional technique of application of a reconstruction plate was associated with significantly better results than the technique using superior-positioned plates in participants with displaced middle third clavicle fractures.

Surgical Interventions for treating acute fractures or non-union of the middle third of the clavicle (Review)
Potential biases in the review process

This review was conducted following criteria and methods set out in a published protocol. We believe that our search strategy was comprehensive, and it has been maintained properly and regularly updated by the contact author (ML). It has included handsearching of conference proceedings and searches for ongoing and recently completed trials. However, it is possible that we have missed some potentially eligible trials. We tried to contact authors of all included trials; nevertheless, only the authors of one trial responded. For this trial (Shen 2008) we obtained unpublished data (means and standard deviations) and some information about the study design.

Agreements and disagreements with other studies or reviews

We found one published systematic review on the management of acute midshaft clavicle fractures (Złowodzki 2005). Two of the three studies included in our review have been published since Złowodzki 2005. Nevertheless, in respect of Comparisons 2 and 3 in our review, the findings are consistent with those of Złowodzki 2005, which were based on non-randomised studies.

Authors' Conclusions

Implications for practice

There is limited evidence on the relative effectiveness of different methods of surgical intervention for treating acute fractures or non-union of the middle third of the clavicle. The relevance of the available evidence depends on current practices in different parts of the world and the availability of more recently introduced implants.

Based on evidence from one small, methodologically weak trial, intramedullary fixation may give better results than plate fixation. Similarly another small, methodologically weak trial showed that a low-contact dynamic compression plate may give better results than a dynamic compression plate for treating non-union of the clavicle. Where plate fixation is considered appropriate, the use of a reconstruction plate fixed superiorly on the main distal fragment and anteriorly on the main proximal fragments appears more effective than fixation with the plate shaped in the form of an 'S' and fixed on the superior surface.

Implications for research

Further studies on the surgical treatment of acute fracture and non-union of the middle third of the clavicle appear justified. We suggest that:

- acute fracture and non-union are somewhat different problems, and that individual studies should include participants with one or the other, but not both, unless appropriate randomisation is used and outcomes reported separately for each condition;
- as non-union is relatively rare, adequately powered multi-centre studies with central randomisation should be developed comparing intramedullary versus plate fixation and different techniques for placement of the plate, such as anterior versus superior plate positioning;
- a consensus on indications for surgical treatment of mid-shaft clavicle fractures should be developed to determine the priorities and inclusion criteria for future comparative studies. Multi-centre randomised controlled trials of high quality could then be developed to compare different techniques of fixation;
- comparisons of techniques in common use, such as pre-contoured plates on the superior and the anterior-inferior aspect of the clavicle, should be done. Furthermore, the efficacy of newer generations of implants (e.g., site-specific pre-contoured locking plates and locking screws) should be tested in randomised controlled clinical trials.

Acknowledgements

We would like to thank Lindsey Elstub, Joanne Elliott and Amy Kavanagh for their assistance in preparing the protocol and review. We thank the following for helpful feedback at editorial review: Bill Gillespie, Helen Handoll, Peter Herbsin and Janet Wile. We also thank Amar Raigan for his comments.

Thanks are extended to the authors of one included trial who responded to requests for additional information and data: Dr Jin-wen Shen (China).
References to studies included in this review

Kabak 2004 [published data only]

Lee 2007 [published data only]

Shen 2008 [published and unpublished data]
Shen JW. Personal communication November 2008.

References to studies excluded from this review

Jabté 2002 [published data only]

Jabté 2005 [published data only]

Lee 2008 [published data only]

Rashid 2000 [published data only]

Shen 1999 [published data only]

Additional references

Ali Khan 1978

Allman 1967

Allman 2003

Bredbury 1996

Boitman 1997

Canadian 2007

Chong 2008

Constant 1987

Court-Brown 2006

Ehriheim 2003

Gummesson 2003

Higgins 2006

Hill 1997