A prospective, randomised study comparing the percutaneous compression plate and the compression hip screw for the treatment of intertrochanteric fractures of the hip

A. Peyser, Y. A. Weil, L. Brocke, Y. Sela, R. Mosheiff, Y. Mattan, O. Manor, M. Liebergall

From Hadassah-Hebrew University Medical Centre, Jerusalem, Israel

Limited access surgery is thought to reduce post-operative morbidity and provide faster recovery of function. The percutaneous compression plate (PCCP) is a recently introduced device for the fixation of intertrochanteric fractures with minimal exposure. It has several potential mechanical advantages over the conventional compression hip screw (CHS). Our aim in this prospective, randomised, controlled study was to compare the outcome of patients operated on using these two devices.

We randomised 104 patients with intertrochanteric fractures (AO/OTA 31.A1-A2) to surgical treatment with either the PCCP or CHS and followed them for one year post-operatively.

The mean operating blood loss was 161.0 ml (8 to 450) in the PCCP group and 374.0 ml (11 to 980) in the CHS group (Student’s t-test, \( p < 0.0001 \)). The pain score and ability to bear weight were significantly better in the PCCP group at six weeks post-operatively. Analysis of the radiographs in a proportion of the patients revealed a reduced amount of medial displacement in the PCCP group (two patients, 4%) compared with the CHS group (10 patients, 18.9%); Fisher’s exact test, \( p < 0.02 \).

The PCCP device was associated with reduced intra-operative blood loss, less post-operative pain and a reduced incidence of collapse of the fracture.

Since its introduction in the late 1970s, the compression dynamic hip screw, which is also known as the sliding or hip screw (CHS), has become a standard device for the fixation of intertrochanteric fractures of the hip.\(^1\,^2\) Its sliding mechanism allows controlled impaction, by which the two sides of the fracture come into tight proximity in order to promote healing while maintaining alignment. Good outcomes have been reported following its use.\(^1\,^3\)

Nevertheless, it has several modes of failure, the most common being cutting-out of the lag screw from the femoral head\(^4\,^5\) and collapse resulting from excessive medial displacement of the femoral shaft.\(^2\,^6\) Some authors have claimed that this is caused by a lack of lateral cortical support.\(^6\,^7\) It has been suggested that the large drill hole with an area of 123 mm\(^2\) (specific to CHS, Richards, Smith and Nephew, Memphis, Tennessee) created for the insertion of the implant can cause secondary fractures and medial displacement of the femoral shaft thereby rendering the primary fracture unstable.\(^6\,^8\,^9\) This phenomenon has been described even in stable fractures.\(^9\)

In addition, the single screw in the femoral neck is insufficient in some cases to provide rotational stability.\(^10\) While these complications do not necessarily impede healing of intertrochanteric fractures, the pain induced on weight-bearing may slow down rehabilitation.

The percutaneous compression plate (PCCP), known also as the ‘Gotfried plate’, was developed in the late 1990s for the fixation of intertrochanteric fractures.\(^1\) It is an extramedullary device inserted through two separate incisions of 2 cm to 3 cm and uses a jig for clamping the plate to the bone and inserting the screws. These consist of two screws 9.3 mm in diameter for placement into the femoral neck, with a sliding mechanism similar to the CHS, and three 4.5 mm cortical screws for the fixation of the plate to the femoral shaft. The potential advantages of the system are the provision of rotational stability, by using two screws in the femoral neck, and a reduction in the potential lateral cortical damage which can be created by a 12 mm single drill hole. In addition, surgical exposure can be decreased using a limited-access technique.\(^1\)
A COMPARISON OF THE PERCUTANEOUS COMPRESSION PLATE AND THE COMPRESSION HIP SCREW

We aimed to test the theoretical benefits of the PCCP based on both clinical and radiological analysis. We hypothesised that by using this construct, better mechanical stability could be achieved with reduced post-operative morbidity.

Patients and Methods

Between March 2002 and June 2003, 225 patients with an intertrochanteric hip fracture were admitted to our institution and were considered for this randomised, controlled study which had been approved by the Institutional Review Board. The inclusion criteria were: age of 60 years or more and an intertrochanteric fracture of the hip, type AO/OTA 31A1-A2, which was amenable to closed reduction. Exclusion criteria were: reverse obliquity fractures (type AO/OTA 31A3), pathological fractures or the presence of metastatic disease and ipsilateral lower-limb surgery, or contralateral hip fracture within the past 12 months. The last was applied in order to exclude prolonged rehabilitation and an increased risk of mortality compared with a unilateral fracture. Altogether, 64 patients were excluded based on these criteria and 39 refused to participate leaving 122 who provided informed consent for participation in the trial. Failure of attempted closed reduction led to the exclusion of a further 11 patients and an additional seven were excluded because of unavailability of surgeons participating in the study. One patient from the PCCP group died in the peri-operative period and was excluded from the analysis. Therefore, 104 patients were randomised but only 103 were included in the final analysis.

Randomisation of the remaining 104 patients to undergo fixation using either a PCCP or a CHS in a 1:1 ratio took place in the operating theatre where sequentially-numbered, sealed, opaque envelopes were opened by a nurse at the time of operation. The randomisation sequence was produced by one of the authors (OM) using a computer-generated, random-number series with blocking in groups of ten. After closed reduction, the operating-theatre nurse opened the next consecutive envelope and exposed the label. In both groups, 45 patients were available for analysis of the functional outcome and 51 for radiological analysis. All 104 patients were included in the analysis of the other parameters assessed. Figure 1 shows the selection process based on the Consort recommendation for randomised, controlled trials.

Blinding during follow-up visits was not feasible for the radiological and outcome analyses because of the difference in the radiological appearance of the devices and of the operative wounds. However, blinding was available for the recording of blood loss and medical complications.

Baseline data included the age, gender, the side of the fracture, the level of haemoglobin (Hb) on admission, the time from admission to surgery and the American Society of Anesthesiologists (ASA) rating of operative risk. Anaemia was defined as a Hb level below 12 g/dl for women and below 13 g/dl for men. Severe anaemia was defined as a level below 10 g/dl. Table I gives the details of both groups. They were similar in gender, side of fracture, ASA score, Hb level on admission, the timing of surgery and classification of the fracture. The mean age of the patients in the PCCP group was 78.9 years (62 to 95) and in the CHS group 82.4 years (63 to 95) (Student’s t-test, p < 0.04). Age adjustment was carried out in the statistical analysis for the main outcome measures.
Treatment. All the patients were positioned supine on a fracture table. A specialised posterior reduction device (PORD; Orthofix, Bussolengo, Italy) was used to assist in the closed reduction of the fracture. This is a radiolucent plastic post connected to the fracture table under the thigh, preventing posterior sagging of the fracture. After successful closed reduction, assignment to treatment was performed as described above. An orthopaedic resident and an attending surgeon from a pool of six attending surgeons (including AP, YAW, YM, ML, RM) and ten orthopaedic residents carried out all the operations. All participating surgeons were experienced in both techniques.

The PCCP (Orthofix Inc, McKinney, Texas) plate, previously described, was implanted as follows. A lateral incision of 2 cm to 3 cm was made at the level of the upper border of the lesser trochanter. The plate, with its cutting distal edge, was inserted beneath the vastus lateralis and placed subperiosteally on the proximal femur using fluoroscopic guidance. A guiding jig was connected parallel to the plate through which all the drills and screws were introduced. Through a second incision of the same length, a bone clamp was inserted which secured the plate to the femur under fluoroscopic control. The clamp was fixed to the guiding jig. The first 9.3 mm hip screw was drilled and positioned in the inferior aspect of the femoral neck, adjacent to the calcar. Three additional self-tapping 4.5 mm cortical screws were placed through the jig to fix the plate to the femur and the bone clamp was removed. The second 9.3 mm hip screw, superior and parallel to the first screw, was then inserted finalising the fixation (Fig. 2). The wounds were irrigated and closed over a suction drain.

The CHS (Richards; Smith & Nephew, Memphis, Tennessee) device was implanted using a standard lateral approach. After drilling of a 3.2 mm guide wire into the desired position (either at the centre of the femoral head in both radiological projections, or slightly inferior to the centre in the anteroposterior (AP) view and centred on the lateral view) in the femoral head and passage of the concen-
anaemia, or both. Condition, or an Hb level below 10 g, symptoms of were transfused if there was a pre-existing cardiovascular intra-operatively and post-operatively and the Hb levels at number of units of packed red blood cells administered the accumulated blood was recorded. In addition, the total swabs. The suction drain was removed after 24 hours and draped, below the operative field, and from the weighed blood collected from a plastic bag taped to the surgical...VOL. 89-B, No. 9, SEPTEMBER 2007

Assessment of outcome. The patients were reviewed at six, 12, 24 weeks and one year post-operatively by an attending surgeon and the research co-ordinator (LB).

Blood loss. Bleeding was measured by the summation of the blood collected from a plastic bag taped to the surgical drapes, below the operative field, and from the weighed swabs. The suction drain was removed after 24 hours and the accumulated blood was recorded. In addition, the total number of units of packed red blood cells administered intra-operatively and post-operatively and the Hb levels at 24 and 72 hours post-operatively were recorded. Patients were transfused if there was a pre-existing cardiovascular condition, or an Hb level below 10 g, symptoms of anaemia, or both.

Hospitalisation and medical complications. During surgery, the time required for the closed reduction and for the whole procedure (skin-to-skin) was documented. Medical complications occurring up to one year post-operatively were noted from the inpatient records, the clinic visits and discharge letters from subsequent admissions to hospital. Complications included deep-vein thrombosis (DVT), urinary-track infection, pulmonary embolism, cardiovascular accident, gastrointestinal, renal and pulmonary (respiratory failure, pneumonia) complications and wound infection. Life-threatening complications were defined as serious cardiovascular complications,17 cerebrovascular accident, pulmonary embolism, and the need for non-orthopaedic surgical intervention. In addition, transfer to an intensive-care unit, the length of hospital stay and subsequent hospital admissions were recorded. Deaths were registered up to one year after operation on the hospital’s computerised database.

Weight-bearing test and pain score. The following test was devised in order to evaluate weight-bearing on the injured hip. First, the patient’s body-weight was measured by standing under supervision on a set of scales with no support. A single-leg stance on the uninjured leg followed by that on the injured leg was performed on the scales using support as needed. The weight-bearing index was calculated as the percentage of single-leg weight divided by the total body-weight. Pain was assessed using a visual analogue scale (VAS).18 The weight-bearing and VAS tests were performed post-operatively on days one to two and five to seven, and at each visit to the outpatient clinic.

Radiological analysis. Plain radiographs (AP and lateral views) of the hip were taken on post-operative days one and five to seven, and at each outpatient visit. These were done in a standardised fashion with both patellae facing up in the AP view and in a standardised frog lateral view. All the radiographs were digitised using a high-resolution scanner using Storage Networking and Image Processing (SN) Medical Systems (Haifa, Israel) and measurements made by a single evaluator (YS), using Digital Imaging and Communication in Medicine (DICOM)-compatible software (SNI Medical Systems). Device-related complications included cutting-out of the hip screw, secondary fractures and failure of the implant. Axial compression and alteration of the neck-shaft angle were assessed using correction factors in order to compensate for the varying degree of femoral rotation on serial radiographs according to the methods described by Doppelt.2 The occurrence of controlled impaction and collapse of the fracture was determined according to Gottfried.7,11 Collapse was defined by the loss of reduction with medial displacement of the shaft, predominantly accompanied by additional fracturing of the lateral cortex. Angular instability was defined as a change of more than 10˚ in the post-operative neck-shaft angle.10

Statistical analysis. A sample size of 100 patients was calculated based on the effect size of reduction of 30 ml in bleeding, with an SD of 80 ml. This yielded a statistical power of 80% in a two-sided hypothesis with a level of significance of 5%.

Comparison of categorical variables was performed by Pearson’s chi-squared and Fisher’s exact tests when appropriate. Ordered categorical variables were compared using the Wilcoxon rank-sum test. Continuous variables were compared using Student’s t-test. The difference between the

Fig. 2
Anteroposterior radiograph of fixation of the PCCP, taken at one year post-operatively.
two groups was considered to be significant when \( p \leq 0.05 \) in a two-sided test. Logistic regression outcomes for the main outcome variables were repeated because of a statistically significant age difference of 3.5 years in the treatment groups. Group comparison of changes over time (during the six-month follow-up period) in compression and protrusion of the hip screw(s) was carried out by a multilevel model.

**Results**

The mean blood loss during surgery and blood collected in the suction drain post-operatively were significantly less in the PCCP group (Table II). However, this change was small and did not influence the mean changes in the post-operative level of Hb at 24 and 72 hours. The total number of transfused packed red blood units was similar in the two groups. Six patients in the CHS group required intra-operative blood transfusions as compared with none in the PCCP group.

**Device-related complications.** These occurred in two patients in the PCCP group and four in the CHS group. Complications in the PCCP group: one case included osteonecrosis resulting in revision to a hemiarthroplasty and in another the device failed by varus collapse and cutting-out within seven days and revision fixation using a CHS was undertaken. Intra-operative complications in the CHS group included one fracture of the lateral cortex of the femur at the level of the greater trochanter and one intra-operative loss of fracture reduction. Cutting-out of the hip screw

**Table II.** Mean (range) identified blood loss and management in both groups

<table>
<thead>
<tr>
<th>Measure</th>
<th>PCCP(^*)</th>
<th>CHS(^†)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean blood loss (ml)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgery</td>
<td>73.4 (5 to 540)</td>
<td>223.5 (6 to 600)</td>
<td>&lt; 0.03, t-test</td>
</tr>
<tr>
<td>Drain</td>
<td>87.6 (0 to 360)</td>
<td>151.2 (10 to 650)</td>
<td>&lt; 0.03, t-test</td>
</tr>
<tr>
<td>Total</td>
<td>161.0 (8 to 450)</td>
<td>374.0 (11 to 980)</td>
<td>&lt; 0.03, t-test</td>
</tr>
<tr>
<td>Mean reduction in Hb (g/dl)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 hours</td>
<td>2.4 (7.4 to 0.8)</td>
<td>2.6 (5.4 to 0.4)</td>
<td>0.10, t-test</td>
</tr>
<tr>
<td>72 hours</td>
<td>2.8 (5.4 to 0.4)</td>
<td>3.0 (6.04 to 0.4)</td>
<td>0.40, t-test</td>
</tr>
<tr>
<td>Mean number of transfused units (range)</td>
<td>1.2 (0 to 4)</td>
<td>1.3 (0 to 4)</td>
<td>0.45, t-test</td>
</tr>
<tr>
<td>Number of patients receiving a transfusion</td>
<td>34</td>
<td>42</td>
<td>0.65, t-test</td>
</tr>
</tbody>
</table>

* PCCP, percutaneous compression plate
† CHS, compression hip screw

**Table III.** Functional recovery assessed by the Visual Analogue Scale (VAS) pain score and weight-bearing test in both groups

<table>
<thead>
<tr>
<th>Measure</th>
<th>PCCP(^*)</th>
<th>CHS(^†)</th>
<th>p-value(^‡)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean VAS score (range)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 to 2 days</td>
<td>4.3 (0 to 10) (n = 29)</td>
<td>4.2 (0 to 10) (n = 30)</td>
<td>0.87</td>
</tr>
<tr>
<td>5 to 7 days</td>
<td>2.7 (0 to 7) (n = 26)</td>
<td>2.4 (0 to 8) (n = 26)</td>
<td>0.61</td>
</tr>
<tr>
<td>6 wks</td>
<td>3.9 (0 to 10) (n = 15)</td>
<td>5.8 (0 to 10) (n = 20)</td>
<td>0.04</td>
</tr>
<tr>
<td>12 wks</td>
<td>3.4 (0 to 7) (n = 15)</td>
<td>3.4 (0 to 7) (n = 20)</td>
<td>0.97</td>
</tr>
<tr>
<td>24 wks</td>
<td>2.6 (0 to 6) (n = 12)</td>
<td>3.4 (0 to 10) (n = 15)</td>
<td>0.47</td>
</tr>
<tr>
<td>Mean weight-bearing test on injured leg (range) (kg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 to 2 days</td>
<td>51.4 (0 to 85) (n = 20)</td>
<td>41.1 (0 to 83) (n = 31)</td>
<td>0.11</td>
</tr>
<tr>
<td>5 to 7 days</td>
<td>55.2 (0 to 85) (n = 20)</td>
<td>60.4 (34 to 86) (n = 21)</td>
<td>0.29</td>
</tr>
<tr>
<td>6 wks</td>
<td>86.7 (67 to 100) (n = 15)</td>
<td>71.0 (0 to 100) (n = 20)</td>
<td>0.04</td>
</tr>
<tr>
<td>12 wks</td>
<td>90.1 (77 to 100) (n = 16)</td>
<td>81.1 (0 to 100) (n = 20)</td>
<td>0.12</td>
</tr>
<tr>
<td>24 wks</td>
<td>94.8 (71 to 100) (n = 16)</td>
<td>85.7 (0 to 100) (n = 18)</td>
<td>0.15</td>
</tr>
<tr>
<td>Mean weight-bearing test on uninjured leg (range) (kg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 to 2 days</td>
<td>84.9 (61 to 100) (n = 20)</td>
<td>81.0 (32 to 100) (n = 30)</td>
<td>0.39</td>
</tr>
<tr>
<td>5 to 7 days</td>
<td>86.3 (71 to 100) (n = 24)</td>
<td>84.7 (61 to 98) (n = 20)</td>
<td>0.55</td>
</tr>
<tr>
<td>6 wks</td>
<td>97.4 (92 to 100) (n = 15)</td>
<td>92.5 (82 to 100) (n = 20)</td>
<td>0.006</td>
</tr>
<tr>
<td>12 wks</td>
<td>96.2 (76 to 100) (n = 18)</td>
<td>91.5 (64 to 100) (n = 20)</td>
<td>0.09</td>
</tr>
<tr>
<td>24 wks</td>
<td>98.6 (92 to 100) (n = 16)</td>
<td>96.8 (83 to 100) (n = 18)</td>
<td>0.25</td>
</tr>
</tbody>
</table>

* PCCP, percutaneous compression plate
† CHS, compression hip screw
‡ all p-values, t-test
occurred in two patients in the CHS group. One underwent removal of the implant and arthroplasty, and the other died before action could be taken.

Hospitalisation and medical complications. The time required for closed reduction of the fracture and operating time was similar in both groups. No differences were found in length of hospital stay, intensive-care unit admissions and re-admission rates.

Measurements of the length of the scar showed a substantial difference, with a mean length of 6.92 cm (5 to 12) in the PCCP group and 15.86 cm (11 to 23) in the compression hip screw group.

Weight-bearing test and pain score. Functional recovery using a pain score and weight-bearing test required cooperation from the patient with an adequate mental state and not all patients could be tested (Table III). During hospitalisation between post-operative days one and seven there was no difference in the pain scores between the two groups (Table III). After six weeks, pain was significantly lower in the PCCP group (Table III). At six months, five patients in the PCCP group had mild pain. Four responded to analgesic treatment and one underwent removal of the implant after healing of the fracture. One patient in the CHS group had thigh pain which responded to conservative treatment.

At six weeks, the PCCP patients could bear significantly more weight on both legs (Table III).

Post-operative complications. These are summarised in Table IV. One patient from the CHS group had a superficial wound infection and required treatment with antibiotics. There were more life-threatening complications in the CHS group although this difference was not statistically significant (Wilcoxon test, p = 0.18). A total of 18 patients (17.5%) died during the 12 months after surgery, four (4%) in the first post-operative week. Five patients (10%) in the PCCP group died and 13 (24.5%) in the CHS group (Table IV). Statistical analysis showed that there was reduced mortality in the PCCP group which did not reach statistical significance after adjusting for ASA rating and age (logistic regression, p = 0.075).

Radiological data. Clinical and radiological parameters reflecting the stability of the fixation are summarised in Table V. The mean axial compression of the hip screws was similar in the two groups. However, collapse of fracture.
alignment was significantly more common in the CHS group (Table V). At six weeks, there was significant lateral protrusion of the hip screw through the barrel of the plate in the CHS group compared with the PCCP group (Table V).

Discussion
Fractures of the hip are common in elderly patients who often have poor bone quality because of osteoporosis as well as other major comorbidities. We assume that minimising the surgical insult for these patients while providing better stability would improve the outcome of operative treatment of fractures of the hip.

We found a mean reduction of 220 ml in the intraoperative blood loss in the PCCP group compared with the CHS group (Student’s t-test, p < 0.03) which could be attributed to the reduced surgical exposure. However, the number of blood transfusions and the post-operative decrease in the level of Hb were not significantly different since the principal blood loss occurs from the fracture itself and not from the surgical exposure. Our findings correlate with results from other studies using minimally-invasive implants such as the intramedullary hip screw. However, in a previous large-scale retrospective study comparing these two devices, the patients required significantly fewer transfusions. It is possible that a larger sample size is required in order to detect the effect of reduced intra-operative blood loss on transfusion requirements. Although the incidence of collapse or medial displacement in the CHS group was higher than in the PCCP group, only two cases of cutting out of the femoral screw occurred in the CHS group, comprising a lower incidence than previously reported.

Our study included only patients with perfect or nearly perfect closed reduction which may have created a bias in favour of less severe fractures, thus improving the overall results.

The fact that less pain was reported and better weight-bearing was found in the PCCP group may imply better mechanical stability in the early phase of healing of the fracture. However, this difference did not persist during longer term follow-up. Additionally, the PCCP resulted in a lower, although statistically non-significant, rate of mechanical complications, supporting the idea of increased stability with this device. However, at six months post-operatively, there was more thigh pain in the PCCP group (five cases versus one in the CHS group). Most of these were mild and only one patient required further surgery.

Other studies of PCCP and CHS techniques have found a significant reduction in operating time in the PCCP group, while one study showed an increased operating time. In our study the operating time was similar in both groups, possibly because our surgeons had previous experience of the use of these implants. The inferior results of the PCCP procedure presented in an earlier study comparing it with the compressive hip screw may be explained by the lack of previous experience with the PCCP of the surgeons in the study. They had carried out only two operations before their investigation began.

Radiological analysis of our patients treated by the CHS showed an increased rate of collapse and angular instability. Loss of alignment of the fracture has previously been shown to be associated with increased pain and delayed mobilisation. A previous study found no difference in the stability provided by a PCCP compared with a CHS but all the fractures fixed by the latter had an antirotational screw added as well as a trochanteric stabilisation plate in certain cases.

Overall, medical complications as well as mortality rates were similar in both groups, although some complications including DVT, cardiovascular problems and cerebrovascular accidents, and the overall number of life-threatening complications appeared to be fewer in the PCCP group. Several previous studies comparing these two forms of fixation have reported no influence on morbidity and mortality rates, but a large-scale retrospective study showed a significant decrease in cardiovascular complications in the PCCP group.

In our study despite randomisation the PCCP group included significantly younger patients, which may have biased the outcome. An additional limitation of our study was the lack of the use of a standardised lower limb or validated musculoskeletal outcome score.

### Table V. Radiological analysis of both groups

<table>
<thead>
<tr>
<th></th>
<th>CHS (n = 37)</th>
<th>PCCP* (n = 35)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screw I</td>
<td>2 (4)</td>
<td>10 (18.9)</td>
</tr>
<tr>
<td>Screw II</td>
<td>1 (2)</td>
<td>7 (15.9)</td>
</tr>
<tr>
<td>Change ≥ 10° in neck-shaft angle (%)</td>
<td>7.2 (-4 to 17)</td>
<td>0.058</td>
</tr>
<tr>
<td>Mean compression of hip screw(s) at 6 weeks (mm) (range)</td>
<td>0.9 (0 to 13)</td>
<td>8.1 (-5 to 35)</td>
</tr>
<tr>
<td>Mean protrusion of screw(s) at 6 weeks (mm) (range)</td>
<td>0.8 (0 to 15)</td>
<td>8.7 (-1 to 29)</td>
</tr>
</tbody>
</table>

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**Alignment** was significantly more common in the CHS group (Table V). At six weeks, there was significant lateral protrusion of the hip screw through the barrel of the plate in the CHS group compared with the PCCP group (Table V).

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Overall, medical complications as well as mortality rates were similar in both groups, although some complications including DVT, cardiovascular problems and cerebrovascular accidents, and the overall number of life-threatening complications appeared to be fewer in the PCCP group. Several previous studies comparing these two forms of fixation have reported no influence on morbidity and mortality rates, but a large-scale retrospective study showed a significant decrease in cardiovascular complications in the PCCP group.

In our study despite randomisation the PCCP group included significantly younger patients, which may have biased the outcome. An additional limitation of our study was the lack of the use of a standardised lower limb or validated musculoskeletal outcome score.
Limited-access surgery has gained in popularity in modern orthopaedic trauma since it has been shown to be associated with decreased bleeding and post-operative pain, reduced post-operative morbidity and faster recovery of function.20 Our study has shown that the PCCP fulfils some of these goals and may improve mechanical stability, if our assessment of better weight-bearing at six weeks post-operatively as a surrogate measure, is acceptable. There is also some evidence of superior radiological performance than with a CHS.

We would like to acknowledge A. Rubinstein, who was an attending surgeon who participated in the study. The following Resident Surgeons also participated in the study: G. Almog, S. Eylon, L. Palladas, O. Lubovsky, S. Beyth, K. Atsesok, M. Hernandez, I. Ilsar, M. Toybenshlak, D. B. David.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

References


