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Supplementary appendix

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SUPPLEMENTARY DOCUMENTS



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Supplementary Document Table of Contents

1.0 FAITH INVESTIGATORS	3
Writing Committee.....	3
Steering Committee.....	3
Global Methods Centre	3
United States Methods Centre.....	3
Netherlands Method Centre.....	3
United Kingdom Method Centre.....	3
Adjudication Committee	3
Participating Clinical Sites	3
Canada	3
United States.....	4
The Netherlands.....	5
International.....	5
2.0 FUNDING SOURCES	6
3.0 SUPPLEMENTAL APPENDICES	7
3.1 Eligibility Criteria	7
3.2 Trial Interventions and Standardization of Peri-Operative Care	7
3.3 Threshold Performance for Internal Fixation.....	8
3.4 Follow-up Processes.....	9
3.5 Outcome Definitions	9
3.6 Overview of Adjudication.....	9
3.7 Sample Size Calculations	10
3.8 Subgroup Analyses and Hypothesized Effects.....	11
3.9 Rationale for Excluding Ineligible Patients from Analyses	11
4.0 SUPPLEMENTARY TABLES	12
Table S1a: Reasons for Exclusion by Clinical Sites.....	12
Table S1b: Reasons for Exclusion by the Adjudication Committee	13
Table S2: Surgical and Peri-Operative Management	14
Table S3: Cancellous Screw Surgical Management.....	15
Table S4: Sliding Hip Screw Surgical Management.....	16
Table S5: Study Outcomes by Treatment Group for Undisplaced Fractures	17
Table S6: Health-Related Quality of Life by Treatment Groups for Undisplaced Fractures	18
Table S7: Study Outcomes by Treatment Group for Displaced Fractures	19
Table S8: Health-Related Quality of Life by Treatment Groups For Displacement	20
Table S9: Interaction Between Secondary Outcomes and Smoker Status.....	21

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3.0 SUPPLEMENTAL APPENDICES

3.1 Eligibility Criteria

Inclusion Criteria	
1)	Adult men or women aged 50 years and older (with no upper age limit).
2)	Fracture of the femoral neck confirmed with either anteroposterior and lateral hip radiographs, computed tomography, or magnetic resonance imaging (MRI).
3)	Operative treatment of displaced fractures within four days of presenting to the emergency room.
4)	Operative treatment of undisplaced fractures within seven days of presenting to the emergency room.
5)	Patient was ambulatory prior to fracture, though they may have used an aid such as a cane or a walker.
6)	Anticipated medical optimization for operative fixation of the hip.
7)	Provision of informed consent by patient or legal guardian.
8)	No other major trauma (defined as an Injury Severity Score >16*).
9)	Low energy fracture, in the judgment of the attending surgeon.

Exclusion Criteria	
1)	Patients not suitable for internal fixation (i.e., severe osteoarthritis, rheumatoid arthritis, or pathologic fracture).
2)	Associated major injuries of the lower extremity (i.e., ipsilateral or contralateral fractures of the foot, ankle, tibia, fibula, knee, or femur; dislocations of the ankle, knee, or hip; or femoral head defects or fracture).
3)	Retained hardware around the affected hip.
4)	Infection around the hip (i.e., soft tissue or bone).
5)	Patients with disorders of known bone metabolism except osteoporosis (i.e., Paget's disease, renal osteodystrophy, osteomalacia).
6)	Patients with a history of frank dementia that would interfere with assessment of the primary outcome (i.e., re-operation at two years).
7)	Likely problems, in the judgment of the investigators, with maintaining follow-up (i.e., patients with no fixed address, report a plan to move out of town, or intellectually challenged patients without adequate family support).

3.2 Trial Interventions and Standardization of Peri-Operative Care

A. Multiple Cancellous Screws

Surgeons were allowed to use any threaded screw or hook pin (i.e., Gouffon, Uppsala, von Bahr, Hansson hook pins, etc.) or cancellous threaded screw (i.e., cannulated or non-cannulated, Depuy-ACE screws, AO/Association for the Study of Internal Fixation (ASIF), Asnis, Richards, etc.). Surgeons followed the technique guides associated with the screw manufacturers.

Surgeons documented the following:

1. Number of screws.
2. Number of washers.
3. Manufacturer.
4. Reduction technique.
5. Decision to perform a capsulotomy or aspirate intracapsular hematoma.
6. Screw configurations, especially of the third screw (outside of two critical placements inferiorly and posteriorly).

No injectable bone substitutes were allowed for augmentation of the implant fixation.

B. Sliding Hip Screw

Patients allocated to sliding hip screws received a single larger diameter partially threaded screw affixed to the proximal femur with a sideplate (with a minimum of two holes and a maximum of four holes) and no supplemental fixations. Surgeons were permitted to use any commercially available sliding hip screw implant (i.e., Stryker, DePuy-ACE, Synthes, Smith and Nephew, Zimmer, etc.), and were to insert implants as per the manufacturers' technical guides. The derotational kirschner wire was to penetrate the acetabulum to provide maximal resistance to torsion. A centre-to-centre approach was recommended, while avoiding a superior and anterior approach. Spiral

blades and helical screws were permitted, because they function similarly to the sliding hip screw. It was documented when spiral blades were employed by the surgeon.

The use of a compression screw, manufacturer, reduction technique, decision to perform a capsulotomy, aspiration of intracapsular hematoma, and final screw position measured by the Tip Apex Distance was documented and based upon surgeon preference. No injectable bone substitutes were allowed for augmentation of the implant fixation.

C. Standardization of Procedures and Peri-Operative Care

Patient positioning, fracture reduction, and surgical exposure in the operating room were not standardized as these are as these are highly variable across the world. There was, however, specific criteria for fracture reduction acceptability. Acceptable reductions were left to the surgeons' best judgment, while aiming at three standards for translation in the anteroposterior and lateral fracture planes:

1. Less than 100% cortical displacement.
2. 10% or less translation of the femoral neck.
3. 3 mm of absolute translation on fluoroscopic views.

To ensure similar peri-operative regimens, it was recommended that participating centres standardize key aspects of pre- and post-operative care.

Pre-Operative Care

1. Pre-operative antibiotic prophylaxis (i.e., cephalosporin or equivalent coverage).
2. Thromboprophylaxis (i.e., Thromboembolic Disease Stockings (TEDS), pneumatic compression boots, or medical prophylaxis to be discontinued in sufficient time to allow surgery as guided by International Normalized Ratio (INR)/Partial Thromboplastin Time (PTT)).
3. Medical consultation to optimize condition prior to surgery.

Post-Operative Care

1. Antibiotic prophylaxis (i.e., cephalosporin or equivalent) for 24 hours.
2. Thromboprophylaxis with unfractionated heparin, Low Molecular Weight Heparin (LMWH), warfarin, anti-platelet agents, or intermittent pneumatic compression boots (current American College of Chest Physicians (ACCP) guidelines recommend LMWH or adjusted dose warfarin (goal INR 2.5; range 2-3)).
3. Weightbearing as tolerated was allowed as patients autoprotect the affected hip during rehabilitation. Post-surgery, patients were encouraged to be weightbearing as tolerated and then advanced according to the attending surgeon's best judgment (i.e., touch weightbearing for displaced fractures was permitted and then advanced according to the surgeon's best judgment).
4. Calcium 600 mg by mouth (PO) daily and/or vitamin D 1000 International Units (IU) per day (provided there were no contraindications), or further investigation and treatment of osteoporosis as recommended by a local osteoporosis expert/consultant as necessary.
5. Appropriate nutritional assessment with administration of oral micronutrient feeds as needed.

Other Care

Due to a lack of evidence favouring a particular approach, the following was recorded but not standardized:

1. Use of pre-operative traction.
2. Surgical delay.
3. Type of anesthetic (i.e., general versus regional).
4. Physiotherapy and rehabilitation programs.

3.3 Threshold Performance for Internal Fixation

Surgeons who participated in the FAITH trial were asked to meet two criteria for expertise for either cancellous screw fixation or sliding hip screw fixation:

1. Surgeons should have performed at least 25 procedures (of either sliding hip screws and/or cancellous screws) in their career (including residency experience in which they assumed responsibility for the procedure).
2. Surgeons should have continued to perform the procedure (at least five per year of either sliding hip screws and/or cancellous screws) in the year prior to the trial start date.

Any combination of procedures (cancellous screws and/or sliding hip screws) performed by surgeons were accepted as expertise. Additionally, any combination of these procedures performed for any type of hip fracture (i.e., femoral neck fracture, intertrochanteric fracture, etc.) were accepted as expertise.

3.4 Follow-up Processes

Time-point	Assessments	Patient Questionnaires
1 week	Follow-up form, reoperations, and adverse events	SF-12, EQ-5D, WOMAC*
2 weeks**	Follow-up form, reoperations, and adverse events	SF-12, EQ-5D, WOMAC*
10 weeks	Follow-up form, radiographs, reoperations, and adverse events	SF-12, EQ-5D, WOMAC*
6 months	Follow-up form, radiographs (if necessary/possible), reoperations, and adverse events	SF-12, EQ-5D, WOMAC*
9 months	Follow-up form, radiographs (if necessary/possible), reoperations, and adverse events	SF-12, EQ-5D, WOMAC*
12 months	Follow-up form, radiographs (if necessary/possible), reoperations, and adverse events	SF-12, EQ-5D, WOMAC*
18 months	Follow-up form, radiographs (if necessary/possible), reoperations, and adverse events	SF-12, EQ-5D, WOMAC*
24 months	Follow-up form, radiographs (if necessary/possible), reoperations, and adverse events	SF-12, EQ-5D, WOMAC*

SF-12=Short Form 12; EQ-5D=EuroQol 5 Dimensions; WOMAC= Western Ontario and McMaster Universities Arthritis Index

*For a sub-set of participants

**Removed to reduce participant burden

3.5 Outcome Definitions

Primary Outcomes

Outcome	Definition
Re-operations (study event)	Re-operations that were classified as study events included: <ul style="list-style-type: none"> ○ Implant removal ○ Implant exchange – Total hip arthroplasty ○ Implant exchange – Hemiarthroplasty ○ Implant exchange – Internal fixation ○ Implant exchange – Spacer ○ Soft tissue procedure ○ Other event as determined by the adjudication committee (proximal femoral osteotomy)
Re-operations (non-study event)	Re-operations that were not classified as study events included: <ul style="list-style-type: none"> ○ Irrigation and debridement ○ Wound closure ○ Planned re-operation ○ Elective implant removal after fracture healing

Secondary Outcomes

Outcome	Definition
Fracture Complications	The Adjudication Committee reviewed fracture complications including avascular necrosis, nonunion, implant failure, and infections.
Mortality	Mortality was adjudicated and it was considered to be an event if it occurred within 24 month of the fracture.
Fracture Healing and Shortening	The Adjudication Committee reviewed all available x-rays for fracture healing. In healed fractures, the Adjudication Committee assessed how much the fracture shortened (No shortening, ≤5 mm [mild], 6-10mm [moderate], >10mm [severe]).
Medical Adverse Events	Medical adverse events, as diagnosed by physicians at the clinical sites, were documented.
Health-Related Quality of Life	The health-related quality of life outcomes being analyzed included: <ul style="list-style-type: none"> • SF-12 Physical Component Score, which measures self-reported quality of life through physical summary measures and a preference-based health utility index • EQ-5D, which is a standardized instrument for use as a measure of health outcome • WOMAC, which is self-administered and assesses the three dimensions of pain, disability and joint stiffness in knee and hip osteoarthritis

3.6 Overview of Adjudication

Adjudication Processes

The following information was excerpted from the FAITH Adjudication Charter, which documents the responsibilities of the Adjudication Committee and the adjudication processes for the FAITH trial.

1) Fracture Eligibility

The Adjudication Committee adjudicated fracture eligibility in cases where eligibility was in doubt based on available pre-surgery and post-surgery x-rays, and completed case report forms. Fracture eligibility was not affected by the implant used, even in situations where the patient did not receive cancellous screws or a sliding hip screw (a protocol deviation).

2) Radiographic Characteristics and Quality of Surgery

The Adjudication Committee classified the level of the femoral neck fracture as subcapital, midcervical or basal, determined the type of fracture and classified it as being undisplaced (Garden I or II) or displaced (Garden III or IV), and classified the fracture using the Pauwels' classification. The Committee determined if the quality of the reduction and the quality of implant placement were acceptable or unacceptable.

3) Fracture Healing

The Adjudication Committee began assessment of a patient's fracture healing after the patient's 24-month follow-up. They adjudicated all available radiographic visits at and after the week 10 time point. Along with fracture healing, the Committee assessed the amount of fracture shortening as follows: no shortening, mild shortening (≤ 5 mm), moderate shortening (6-10mm), or severe shortening (>10 mm).

4) Re-operations

The Adjudication Committee adjudicated re-operations after each patient had completed their 24-month follow-up (or following early withdrawal). Specifically, the Committee adjudicated all re-operations to promote fracture healing, relieve pain, treat infection, or improve function. The Committee reviewed all available x-rays, and data from the patient's completed case report forms. Planned re-operations were not considered events.

5) Fracture-Related Complications

The Adjudication Committee adjudicated fracture-related complications after each patient had completed their 24-month follow-up (or following early withdrawal). The Committee reviewed all available x-rays, and data from the patient's completed case report forms.

6) Mortality

The Adjudication Committee adjudicated mortality as required following a patient's early withdrawal. The Committee reviewed all data from the patient's completed case report forms.

3.7 Sample Size Calculations (FAITH Investigators. BMC Musculoskeletal Disorders 2014, 15:219)

Estimated study power for 750 patients per treatment arm (N = 1500)

Baseline risk (Year 1) [^]	Relative risk reduction				
	10%	15%	20%	25%	30%
20%	15.9%	30.8%	50.5%	70.5%	86.1%
25%	19.6%	38.7%	61.6%	81.5%	93.5%
30%	23.6%	46.8%	71.7%	89.3%	97.4%
35%	28.2%	55.2%	80.3%	94.5%	99.1%
40%	33.3%	63.6%	87.3%	97.5%	99.7%

*Number of patients per treatment arm, alpha = 0.05.

[^]Year 2 risk is 1/3 that of year 1.

Bold numbers indicate statistical power range for this study.

Estimated study power for 500 patients per treatment arm (N = 1,000)

Baseline risk (Year 1) [^]	Relative risk reduction						
	10%	15%	20%	25%	30%	35%	40%
15.5%	14.5%	28.5%	48.1%	69.3%	86.3%	95.7%	99.2%

*Number of patients per treatment arm, alpha = 0.05.

[^]Year 2 risk is 27.2%.

Bold numbers indicate statistical power range for this study.

3.8 Subgroup Analyses and Hypothesized Effects

At the onset of the FAITH trial, we identified one important subgroup and planned to perform the analysis with the primary endpoint as the outcome:

1. Displaced vs undisplaced fractures – We hypothesize that sliding hip screw will perform better in patients with displaced fractures

At the end of the trial but prior to unblinding, we identified another five subgroup analyses and corresponding hypotheses on their effects:

1. Normal BMI vs Overweight or Obese BMI – We hypothesize that sliding hip screw will perform better in obese patients
2. Level of the Fracture Line – We hypothesize that sliding hip screw will perform better in base of neck fractures (basicervical)
3. Pauwel’s Classification – We hypothesize that sliding hip screw will perform better in more vertical fracture lines (Higher Pauwel’s class)
4. Smoking Status – We hypothesize that sliding hip screw will perform better in current smokers.
5. Quality of Reduction – We hypothesize that sliding hip screw will perform better with unacceptable reduction. It should be noted that quality of reduction was assessed following fixation and post-randomization; therefore any conclusions that we make based on a significant subgroup effect will be hypothesis-generating.

After unblinding, we identified a single post hoc subgroup analysis:

1. Age – We hypothesize that there will be no significant differences in performance between sliding hip screw and cancellous screw in patients under the age of 60. For patients between the ages of 60 and 80 years of age, we hypothesize that sliding hip screw will perform better. For patients over 80 years of age, we hypothesize that sliding hip screw will perform better.

3.9 Rationale for Excluding Ineligible Patients from Analyses

In addressing the issue of how to manage patients who were inadvertently/incorrectly randomized despite not satisfying all criteria for eligibility, we were guided by the recommendations of Fergusson et al. The authors of this paper maintain that including ineligible patients in the analyses for clinical trials adds random error and therefore decreases the power of the trial to answer the question(s) being addressed.

One must accept this added random error if it is not possible to exclude such patients without introducing bias. It is, however, often possible to exclude ineligible patients without bias. This requires the following conditions: i) The relevant information documenting patient ineligibility is collected soon after randomization ii) the Adjudication Committee making the decision about excluding ineligible patients is unaware of the treatment allocation and iii) the Adjudication Committee making the decision is unaware of the outcome of the patients who prove ineligible. In the current study, we ensured all three conditions were met for any randomized patients excluded from the analysis.

Reference:

Fergusson D, Aaron S, Guyatt GH, Hebert P. Post-randomization exclusion of patients enrolled in clinical trials: The intention-to-treat principle does not necessitate that all patients be analyzed. *BMJ* 2002;325:652-4.

4.0 SUPPLEMENTARY TABLES

Table S1a: Reasons for Exclusion by Clinical Sites

Reason for Exclusion N=5463*	N(%)
Surgeon Preference: Requires HA, THA, Prosthesis, Bipolar	2060 (37.7%)
Surgeon Preference: Unsuitable for internal fixation (arthritis/pathologic)	1738 (31.8%)
Cognitive impairment	1110 (20.3%)
Declined to consent	589 (10.8%)
Anticipated problematic follow-up	515 (9.4%)
Less than 50 years old	319 (5.8%)
Not medically optimized	305 (5.6%)
Major trauma	292 (5.3%)
High energy fracture	250 (4.6%)
Not ambulatory pre-injury	227 (4.2%)
Chronic condition or multiple comorbidities	211 (3.9%)
Fracture cannot be closed reduced	211 (3.9%)
National guidelines (for Dutch patients)	199 (3.6%)
Associated injuries	191 (3.5%)
Displaced fracture not treatable within 4 days of emergency room presentation	154 (2.8%)
Undisplaced fracture not treatable within 7 days of emergency room presentation	116 (2.1%)
Surgeon Preference: Requires specific fixation type	82 (1.5%)
Retained hardware	79 (1.4%)
Another trial participant	76 (1.4%)
Surgeon who is not participating in the study	73 (1.3%)
Language/communication barrier	70 (1.3%)
Metabolic bone disease	64 (1.2%)
Severe Parkinson's disease	54 (1.0%)
Non-operative or conservative treatment	46 (0.8%)
Infection	43 (0.8%)
Other reasons	26 (0.5%)
No femoral neck fracture	23 (0.4%)
Not seen within time frame	6 (0.1%)
Missed**	146

HA=hemiarthroplasty; THA=total hip arthroplasty;

*Please note, some patients were excluded for more than one reason

**Missed: patients who were not screened for study inclusion as result of error or lack of study staff availability

Table S1b: Reasons for Exclusion by the Adjudication Committee

Reason for Exclusion N=29	N(%)
Ineligible fracture	15 (51.7%)
Delayed surgical treatment beyond 4 days	6 (20.7%)
Not 50 years or older	2 (6.9%)
Other major trauma	2 (6.9%)
Delayed surgical treatment beyond 7 days	1 (3.5%)
Patient did not have anticipated medical optimization	1 (3.5%)
Does not have a low energy fracture in the judgement of the attending surgeon	1 (3.5%)
Retained hardware around the hip (i.e., soft tissue or bone)	1 (3.5%)

Table S2: Surgical and Peri-Operative Management

	Sliding Hip Screw N=542	Cancellous Screws N=537	Total N=1079
Time From Injury to Surgery, mean (SD) (hours)	N=496 50.4 (69.5)	N=498 47.1 (61.9)	N=994 48.8 (65.8)
Length of Procedure, mean (SD) (minutes)	N=531 64.6 (33.2)	N=529 55.1 (33.9)	N=1060 59.8 (33.9)
Who Performed Majority of Procedure, n (%)	N=533	N=532	N=1065
Surgeon	292 (54.8%)	295 (55.5%)	587 (55.1%)
Resident	214 (40.2%)	214 (40.2%)	428 (4.02%)
Fellow	21 (3.9%)	16 (3.0%)	37 (3.5%)
Registrar	6 (1.1)	7 (1.3%)	13 (1.2%)
Type of Anaesthesia, n (%)	N=533	N=532	N=1065
General	327 (61.4%)	316 (59.4%)	643 (60.4%)
Regional	218 (40.9%)	222 (41.7%)	440 (41.3%)
Total Blood Loss, mean (SD) (mL)	126.6 (106.9)	70.3 (95.7)	98.6 (105.2)
Capsulotomy Performed, n (%)	N=531	N=531	N=1062
Yes	48 (9.0%)	45 (8.5%)	93 (8.8%)
No	483 (91.0%)	486 (91.5%)	969 (91.2)
Aspiration of Intracapsular Hemotoma, n (%)	N=533	N=532	N=1065
Yes	18 (3.4%)	21 (4.0%)	39 (3.7%)
No	515 (96.6%)	511 (96.0%)	1026 (96.3%)
Post-operative Antibiotic Prophylaxis, n (%)	N=533	N=532	N=1065
Yes	526 (98.7%)	522 (98.1%)	1048 (98.4%)
No	7 (1.3%)	10 (1.9%)	17 (1.6%)
Thromboprophylaxis, n (%)	N=533	N=532	N=1065
No	3 (0.6%)	2 (0.4%)	5 (0.5%)
Yes	530 (99.4%)	530 (99.6%)	1060 (99.5%)
Heparin	46 (8.6%)	57 (10.8%)	103 (9.7%)
LWMH	427 (80.6%)	426 (80.4%)	853 (80.0%)
Warfarin	21 (4.0%)	28 (5.3%)	49 (4.6%)
Mechanical	104 (19.6%)	91 (17.1%)	195 (18.4%)
Other	39 (7.4%)	37 (7.0%)	76 (7.2%)
Weightbearing, n (%)	N=533	N=532	N=1065
Yes, as tolerated	503 (94.4%)	494 (92.9%)	997 (93.6%)
Non-weightbearing	30 (5.6%)	38 (7.1%)	68 (6.4%)
Full weightbearing	0 (0%)	0 (0%)	0 (0%)
Patient taking 600mg of Calcium and/or 1000mg of Vitamin D, n (%)	N=533	N=531	N=1064
Yes	505 (94.8%)	493 (92.8%)	998 (93.8%)
No	28 (5.2%)	38 (7.2%)	66 (6.2%)
Patient Discharge Location, n (%)	N=531	N=528	N=1059
Home	276 (52.0%)	275 (52.1%)	551 (52.0%)
Rehabilitation facility	169 (31.8%)	167 (31.5%)	336 (31.7%)
Aging and long term care facility	66 (12.4%)	71 (13.5%)	137 (12.9%)
Other hospital	12 (2.2%)	10 (1.9%)	22 (2.1%)
Family member's home	5 (1.0%)	4 (0.8%)	9 (0.9%)
Assisted living	1 (0.2%)	0 (0%)	1 (0.1%)
Deceased	2 (0.4%)	1 (0.2%)	3 (0.3%)
Patient Aids at Discharge, n (%)	N=530	N=528	N=1058
Bedridden	23 (4.3%)	24 (4.6%)	47 (4.4%)
Wheelchair	119 (22.5%)	120 (22.7%)	239 (22.6%)
Walker	401 (75.7%)	384 (72.7%)	785 (74.2%)
Two crutches	99 (18.7%)	99 (18.8%)	198 (18.7%)
One crutch	9 (1.7%)	13 (2.5%)	22 (2.1%)
Cane	10 (1.9%)	9 (1.7%)	19 (1.8%)
Other	14 (2.6%)	12 (2.3%)	26 (2.5%)
Person assistance	13 (2.4%)	11 (2.0%)	24 (2.2%)
Stick	0 (0%)	1 (0.15%)	1 (0.1%)
Deceased	1 (0.2%)	1 (0.15%)	2 (0.2%)

SD=standard deviation

Table S3: Cancellous Screw Surgical Management

	Cancellous Screws N=537	Patients Crossed from Sliding Hip Screw N=16
Hook Pins Used, n (%)	N=508	
Yes	22 (4.3%)	0 (0%)
No	486 (95.7%)	16 (100%)
Number of Screws Used, n (%)	N=509	
1	0 (0%)	0 (0%)
2	28 (5.5%)	1 (6.2%)
3	464 (91.2%)	15 (93.8%)
4	15 (2.9%)	0 (0%)
5	2 (0.4%)	0 (0%)
Diameter of Screws, mean (SD)	N=509 7.3 (3.5)	7.0 (0.4)
Partially Threaded Screws with Short Threads, n (%)	N=508	
0	92 (18.1)	3 (18.8%)
1	29 (5.7%)	3 (18.8%)
2	59 (11.6%)	1 (6.2%)
3	322 (63.4%)	9 (56.2%)
4	5 (1.0%)	0 (0%)
5	1 (0.2%)	0 (0%)
Partially Threaded Screws with Long Threads, n (%)	N=508	
0	345 (67.9%)	9 (56.3%)
1	40 (7.9%)	2 (12.5%)
2	42 (8.3%)	2 (12.5%)
3	77 (15.1%)	3 (18.7%)
4	4 (0.8%)	0 (0%)
Formation of screws, n (%)	N=509	
2 Screws Vertical	10 (2.0%)	1 (6.3%)
2 Screws Inferior and Posterior	16 (3.1%)	0 (0%)
3 Screws Triangle (apex at top)	147 (28.9%)	4 (25%)
3 Screws Triangle apex at bottom)	308 (60.5%)	11 (68.7%)
4 Screws Square	6 (1.2%)	0 (0%)
4 Screws Diamond	7 (1.4%)	0 (0%)
Other	15 (2.9%)	0 (0%)
Screw Aim, n (%)	N=509	
Parallel	442 (86.8%)	14 (87.5%)
Converging	13 (2.6%)	0 (0%)
Diverging	54 (10.6%)	2 (12.5%)
Number of Washers, n (%)	N=509	
0	283 (55.6%)	5 (31.3%)
1	34 (6.7%)	1 (6.3%)
2	68 (13.3%)	3 (18.8%)
3	118 (23.2%)	7 (43.7%)
4	5 (1.0%)	0 (0%)
7	1 (0.2%)	0 (0%)
Manufacturer, n (%)	N=509	
Synthes	289 (56.8%)	11 (68.8%)
Stryker	22 (4.3%)	0 (0%)
DePuy	38 (7.5%)	0 (0%)
Smith & Nephew	35 (6.9%)	0 (0%)
Biomet	8 (1.5%)	0 (0%)
Zimmer	39 (7.7%)	1 (6.2%)
Hansson	1 (0.2%)	0 (0%)
Other	77 (15.1%)	4 (25.0%)

SD=standard deviation

Table S4: Sliding Hip Screw Surgical Management

	Sliding Hip Screw N=542	Patients Crossed from Cancellous Screws N=6
Manufacturer, n (%)	N=503	
Synthes	361 (71.8%)	4 (66.7%)
Stryker	21 (4.2%)	0 (0%)
DePuy	1 (0.2%)	0 (0%)
Smith & Nephew	23 (4.5%)	0 (0%)
Zimmer	42 (8.4%)	0 (0%)
AO	0 (0%)	0 (0%)
J&J	0 (0%)	0 (0%)
Arthrex	0 (0%)	0 (0%)
Other	55 (10.9%)	2 (33.3%)
Formation of screws, n (%)	N=503	
Centre-centre Position	368 (73.2%)	4 (66.7%)
Superior Position	3 (0.6%)	0 (0%)
Anterior Position	11 (2.1%)	0 (0%)
Inferior Position	89 (17.7%)	2 (33.3%)
Posterior Position	19 (3.8%)	0 (0%)
Other	13 (2.6%)	0 (0%)
Number of Holes in Sideplate, n (%)	N=503	
1	1 (0.2%)	0 (0%)
2	387 (76.9%)	4 (66.7%)
3	24 (4.8%)	0 (0%)
4	80 (15.9%)	2 (33.3%)
5	1 (0.2%)	0 (0%)
6	2 (0.4%)	0 (0%)
7	8 (1.6%)	0 (0%)
Bicortical Sideplate, n (%)	N=503	
Yes	1 (0.2%)	0 (0%)
No	502 (99.8%)	6 (100%)
Supplemental Screws Used, n (%)	N=503	
No	388 (77.1%)	4 (66.7%)
Yes	115 (22.9%)	2 (33.3%)
With washer	30 (26.1%)	2 (100%)
Without washer	85 (73.9%)	0 (0%)
Supplemental Screw Placement, n (%)	N=115	
All left in place	96 (83.5%)	1 (50%)
All used and removed	15 (13.0%)	0 (0%)
Some left in place	4 (3.5%)	1 (50%)
Spiral Blades Used, n (%)	N=503	
Yes	1 (0.2%)	0 (0%)
No	502 (99.8%)	6 (100%)
Helical Screws Used, n (%)	N=503	
Yes	0 (0%)	0 (0%)
No	503 (100%)	6 (100%)
Tip to Apex Distance, mean (SD) (mm)	N=503 17.3 (12.0)	26.0 (14.5)

SD=standard deviation

Table S5: Study Outcomes by Treatment Group for Undisplaced Fractures

	Overall	Sliding Hip Screw	Cancellous Screws	Hazard Ratio	p value
	N=729	N=360	N=369	(95% CI)	
Primary Endpoint (re-operation)	120 (16.5%)	60 (16.7%)	60 (16.3%)	1.00 (0.69, 1.46)	0.99
Implant Removal	31 (4.3%)	6 (1.7%)	25 (6.8%)	0.25(0.10, 0.59)	0.001
Implant Exchange – THA	58 (8.0%)	40(11.1%)	18 (4.9%)	2.33 (1.30, 4.17)	0.004
Implant Exchange – HA	30 (4.1%)	15 (4.2%)	15 (4.1%)	1.03 (0.51, 2.07)	0.95
Implant Exchange – Internal Fixation	9 (1.2%)	1 (0.3%)	8 (2.2%)	0.13 (0.02, 1.02)	0.04
Implant Exchange – Spacer	2 (0.3%)	1 (0.3%)	2 (0.3%)	1.03 (0.06, 16.33)	0.99
Soft Tissue Procedure	1 (0.1%)	0 (0%)	1 (0.3%)	0.34 (0.01, 8.36)	0.32
Proximal Femoral Osteotomy	1 (0.1%)	1 (0.3%)	0 (0%)	3.07(0.13, 75.23)	0.31
Secondary Endpoints					
Avascular Necrosis	56 (7.7%)	33 (9.2%)	23 (6.2%)	1.77 (0.89, 3.51)	0.10
Nonunion	27 (3.7%)	18(5.0%)	9 (2.4%)	2.05 (0.93, 4.50)	0.07
Implant Failure	38 (5.2%)	18 (5.0%)	20 (5.4%)	0.92 (0.50, 1.71)	0.80
Infection	7 (1.0%)	2 (0.6%)	5 (1.4%)	0.41 (0.08, 2.10)	0.27
Superficial	2 (0.3%)	0 (0%)	2 (0.5%)	0.21 (0.01, 4.26)	0.16
Deep	5 (0.7%)	2 (0.6%)	3 (0.8%)	0.68 (0.11, 4.07)	0.67
Fracture Healing (N=571)*					0.19
Healed by Month 24	418 (73.2%)	198 (70.2%)	220 (76.1%)		
Not Healed by Month 24	1 (0.2%)	1 (0.4%)	0 (0%)		
Not Healed at Time of Last Visit	152 (26.6%)	83 (29.4%)	69 (23.9%)		
Fracture Shortening >5mm (N=418)**	81 (19.4%)	32 (16.2%)	49 (22.3%)	0.73 (0.49, 1.08)	0.11
Mortality	115 (17.3%)	48 (14.6%)	67 (19.8%)	0.69 (0.47, 1.02)	0.06

THA=total hip arthroplasty; HA=hemiarthroplasty

Relative risk was calculated where the total number of events is less than 50

*571 patients were included in the fracture healing analysis. 284 patients did not have x-rays available for fracture healing adjudication, and therefore were not included in the denominator.

**418 patients were included in the shortening analysis based on the number of healed fractures with shortening data.

Table S6: Health-Related Quality of Life by Treatment Groups for Undisplaced Fractures

	Sliding Hip Screw Mean (SD), N	Cancellous Screws Mean (SD), N	Adjusted Mean Difference (95% CI)	p Value for Differences Between Groups/
12 Months				
SF-12 PCS	39.9 (11.2), 158	41.6 (10.6), 157	-0.02 (-2.14, 2.10), N=298	0.99
WOMAC	45.6(19.9), 160	40.9 (16.5), 158	2.81 (-1.03, 6.64), N=296	0.15
EQ-5D Index	0.77 (0.19), 167	0.80 (0.17), 167	-0.01 (-0.05, 0.02), N=314	0.44
24 Months				
SF-12 PCS	41.5(10.7), 145	40.2 (11.8), 122	1.32 (-1.27, 3.91), N=245	0.32
WOMAC	40.6 (16.1), 141	39.9 (16.9), 123	0.38 (-3.64, 4.40), N=239	0.85
EQ-5D Index	0.77 (0.20), 156	0.80 (0.18), 139	-0.02 (-0.06, 0.02), N=269	0.26

Table S7: Study Outcomes by Treatment Group for Displaced Fractures

	Overall	Sliding Hip Screw	Cancellous Screws	Hazard Ratio	p value
	N=350	N=182	N=168	(95% CI)	
Primary Endpoint (re-operation)	104 (29.7%)	47 (25.8%)	57(33.9%)	0.53 (0.34, 0.82)	0.005
Implant Removal	43 (12.3%)	19 (10.4%)	24 (14.3%)	0.73 (0.42, 1.28)	0.27
Implant Exchange – THA	46 (13.1%)	24 (13.2%)	22 (13.1%)	1.00 (0.59, 1.73)	0.98
Implant Exchange – HA	25 (7.1%)	11 (6.0%)	14 (8.3%)	0.73 (0.34, 1.55)	0.41
Implant Exchange – Internal Fixation	7 (2.0%)	1 (0.6%)	6 (3.6%)	0.15 (0.02, 1.26)	0.06
Implant Exchange – Spacer	1 (0.3%)	0 (0%)	1 (0.6%)	0.31 (0.01, 7.50)	0.30
Soft Tissue Procedure	5 (1.4%)	4 (2.2%)	1 (0.6%)	3.69 (0.42, 32.70)	0.21
Proximal Femoral Osteotomy	1 (0.3%)	0 (0%)	1 (0.6%)	0.31 (0.01, 7.50)	0.30
Secondary Endpoints					
Avascular Necrosis	22 (6.3%)	17 (9.3%)	5 (3.0%)	3.14 (1.18 , 8.32)	0.01
Nonunion	39 (11.1%)	15 (8.2%)	24 (14.3%)	0.58 (0.31, 1.06)	0.07
Implant Failure	49 (14.0%)	24 (13.2%)	25 (14.9%)	0.89 (0.53, 1.49)	0.65
Infection	12 (3.4%)	8 (4.4%)	4 (2.4%)	1.85 (0.57, 6.02)	0.30
Superficial	6 (1.7%)	4 (2.2%)	2 (1.2%)	1.85 (0.34, 9.95)	0.47
Deep	6 (1.7%)	4 (2.2%)	2 (1.2%)	1.85 (0.34, 9.95)	0.47
Fracture Healing (N=224)*					0.41
Healed by Month 24	114 (50.9%)	64 (55.2%)	50 (46.3%)		
Not Healed by Month 24	2 (0.9%)	1 (0.9%)	1 (0.9%)		
Not Healed at Time of Last Visit	108 (48.2%)	51 (44.0%)	57 (52.8%)		
Fracture Shortening >5mm (N=114)**	65 (57.0%)	37 (57.8%)	28 (56.0%)	1.03 (0.75, 1.43)	0.85
Mortality	35 (13.1%)	20 (14.5%)	15 (11.5%)	1.12 (0.51, 2.46)	0.77

THA=total hip arthroplasty; HA=hemiarthroplasty

Relative risk was calculated where the total number of events is less than 50

*224 patients were included in the fracture healing analysis. 284 patients did not have x-rays available for fracture healing adjudication, and therefore were not included in the denominator.

**114 patients were included in the shortening analysis based on the number of healed fractures with shortening data.

Table S8: Health-Related Quality of Life by Treatment Groups For Displacement

	Sliding Hip Screw Mean (SD), N	Cancellous Screws Mean (SD), N	Adjusted Mean Difference (95% CI)	p Value for Differences Between Groups/
12 Months				
SF-12 PCS	42.8 (10.7), 77	42.6(11.1), 67	-0.03 (-3.29, 3.24), N=137	0.99
WOMAC	43.0 (17.4), 80	42.4 (17.3), 68	0.11 (-5.30 5.53), N=142	0.97
EQ-5D Index	0.78 (0.20), 82	0.79 (0.18), 71	-0.02 (-0.07, 0.04), N=146	0.58
24 Months				
SF-12 PCS	41.8 (11.4), 62	43.8 (11.6), 59	-1.13 (-4.79, 2.53), N=113	0.54
WOMAC	41.7 (17.0), 64	39.4 (17.7), 60	0.46 (-5.88, 6.79), N=116	0.89
EQ-5D Index	0.80 (0.19), 76	0.79 (0.20), 68	0.02 (-0.04, 0.07), N=137	0.59

Table S9: Interaction Between Secondary Outcomes and Smoker Status

	Overall	Sliding Hip Screw	Cancellous Screws	Hazard Ratio	p Value
	N=1079	N=542	N=537	(95% CI)	
Implant Removal	74 (6.9%)	25 (4.6%)	49 (9.1%)	0.42 (0.25, 0.70)	0.001
Smoker	18 (9.0%)	5 (5.0%)	13 (13.0%)	0.17 (0.05, 0.63)	0.13 for interaction
Non-smoker	56 (6.5%)	20 (4.6%)	36 (8.3%)	0.52 (0.29, 0.92)	
Implant Exchange – Overall	169 (15.7%)	90 (16.6%)	79 (14.7%)	1.07 (0.78, 1.46)	0.67
Smoker	30 (14.9%)	12 (11.9%)	18 (18.0%)	0.49 (0.23, 1.08)	0.03 for interaction
Non-smoker	139 (16.1%)	78 (18.1%)	61 (14.1%)	1.26 (0.89, 1.79)	
Avascular Necrosis	78 (7.2%)	50 (9.2%)	28 (5.2%)	1.78 (1.09, 2.91)	0.02
Smoker	8 (4.0%)	4 (4.0%)	4 (4.0%)	0.69 (0.15, 3.15)	0.14 for interaction
Non-smoker	70 (8.1%)	46 (10.7%)	24 (5.6%)	2.01 (1.18, 3.41)	
Nonunion	66 (6.1%)	33 (6.1%)	33 (6.2%)	0.86 (0.52, 1.41)	0.55
Smoker	16 (8.0%)	5 (5.0%)	11 (11.0%)	0.31 (0.10, 0.99)	0.049 for interaction
Non-smoker	50 (5.8%)	28 (6.5%)	22 (5.1%)	1.14 (0.64, 2.03)	
Mortality	156 (14.5%)	73 (13.5%)	83 (15.5%)	0.81 (0.58, 1.12)	0.20
Smoker	33 (16.4%)	14 (13.9%)	19 (19%)	0.65 (0.31, 1.37)	0.47 for interaction
Non-smoker	111 (12.9%)	53 (12.3%)	58 (13.4%)	0.89 (0.61, 1.29)	