ORTHOPAEDIC MANAGEMENT OF HIP FRACTURES

MARTYN PARKER
MY ROLE

ORTHOPAEDIC SURGEON RESPONSIBLE FOR THE
PRE-OPERATIVE ASSESSMENT + OPERATIVE TREATMENT + POST-OPERATIVE CARE + FOLLOW-UP
FOR ALL HIP FRACTURE PATIENTS ADMITTED TO PETERBOROUGH DISTRICT HOSPITAL
A & E MANAGEMENT

- Analgesia

- Assessment, bloods, ECG

- Intravenous fluids (blood loss may be up to 1 litre)

- Avoid excessive delays (Fast tracking policy and check list)
PRE-OPERATIVE CARE ON WARD

- RESUSCITATION AND FLUID BALANCE (URINARY CATHETER)
- THROMBOEMBOLIC PROPHYLAXIS (LMWH GIVEN AT 1800 HOURS)
- ANALGESIA
- MINIMISE DELAYS TO THEATRE
- PRESSURE AREA CARE
- PLANNING FOR DISCHARGE
Timing of surgery

- Surgery should be as soon as possible after admission

- Delays of more than 48 hours from admission will increase morbidity (pressure sores, thromboembolic, pneumonia, UTI)

- For every 8 hours of delay results in an increased of hospital stay of 1 day

Acceptable reasons for delaying surgery

- Anaemia (Haemoglobin < about 90g/l)
- Dehydration or acute uraemia
- Severe electrolyte imbalance
  (Na < 120 or > 150  K < 2.8 or > 6.0 mmol/l)
- Uncontrolled diabetes
- Uncontrolled heart failure
- Correctable cardiac arrhythmia
- Acute chest infection or exacerbation of chronic chest
Unacceptable reasons for delaying surgery (>24 hours from admission)

- Medical assessment
- Unnecessary investigations
- Minor electrolyte abnormalities
- Warfarin with high INR
- Aspirin, clopidogrel
- Lack of consent
- Lack facilities
Surgery

Avoidance of prolonged surgery

All minimally invasive surgery
Unacceptable aspects of surgery

- Unsupervised junior staff
- Operations lasting more than one hour
- Poor surgery resulting in complications (cut-out, sepsis, dislocation)
Post-operative care

Unrestricted mobilisation the day after surgery
DISCHARGE HOME AS SOON AS ABLE

- Avoid transfers to any other wards (death or discharge home only)

- Use of early supported discharged as much as able
NUMBER OF PATIENTS

87 88 89 90 91 92 93 94 95 96 97 98 99 0 1 2 3 4 5
MEAN TOTAL HOSPITAL STAY (DAYS)

Scottish hip fracture audit - 36 days

Dr Foster, England – 26 days
30 DAY MORTALITY (%)

NATIONAL AVERAGE 13%
INTRACAPSULAR FRACTURES
CLASSIFICATION

DIVISION INTO STABLE (IMPACTED) AND UNSTABLE (DISPLACED) FRACTURES

KAPPA VALUES
INTRA-OBSERVER - 0.75
INTER-OBSERVER - 0.85
GARDEN CLASSIFICATION

ALL STUDIES INDICATE UNACCEPTABLE HIGH INTER AND INTRA-OBSERVER VARIATION

ONLY OF VALUE FOR DIVISION INTO DISPLACED VERSUS UNDISPLACED
AO CLASSIFICATION

HIGH INTER- AND INTRA-OBSERVER VARIATION

ALL KAPPA VALUES BELOW 0.5
(Poor Correlation)

JBJS 1998;80-B:679-83.
OPERATIVE VS CONSERVATIVE UNDISPLACED INTRACAPSULAR INTERNAL FIXATION IS RECOMMENDED FOR ALL PATIENTS

<table>
<thead>
<tr>
<th></th>
<th>Non-union</th>
<th>AVN</th>
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<tbody>
<tr>
<td>Conservative</td>
<td>25-60%</td>
<td>5%</td>
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<tr>
<td>Operative</td>
<td>8%</td>
<td>5%</td>
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OPERATIVE VS CONSERVATIVE

DISPLACED INTRACAPSULAR

NON-UNION IS INEVITABLE WITH CONSERVATIVE TREATMENT AND RESULTS IN A FUNCTIONLESS AND OFTEN PAINFUL HIP

CONSIDER SURGERY EVEN IN THE IMMOBILE
THE KEY DECISION IS SHOULD THE FEMORAL HEAD BE PRESERVED OR REPLACED
INDICATIONS FOR INTERNAL FIXATION OF INTRACAPSULAR FRACTURES
UNDISPLACED FRACTURES

SHOULD ALL BE TREATED BY INTERNAL FIXATION

THERE IS NO PLACE FOR ARTHROPLASTY
PARTIALLY DISPLACED FRACTURES
VERY FRAIL PATIENTS

PATIENTS UNFIT FOR ARTHROPLASTY
YOUNG PATIENTS

AGE LESS THAN ABOUT 70 YEARS

IF THE PATIENT IS EXPECTED TO LIVE LONGER THAN THE PROSTHESIS THAT IS TO BE INSERTED THEN AN ATTEMPT SHOULD BE MADE TO PRESERVE THE FEMORAL HEAD
‘ELDERLY’ WITH A DISPLACED INTRACAPSULAR FRACTURE

INTERNAL FIXATION

LESS SEPSIS
LESS TRAUMATIC
RE-OPERATIONS POSSIBLE

ARTHROPLASTY

LOWER RE-OPERATION RATE
(40% VS 5%)
MORE ‘RELIABLE’ OPERATION
TENDENCY TO BETTER FUNCTION

NO DIFFERENCE IN OUTCOME FOR HOSPITAL STAY
TIME TO MOBILISATION
FUNCTIONAL OUTCOME
INDICATIONS FOR ARTHROPLASTY
AGED OVER ABOUT 70 YEARS

ARTHROPLASTY IS GENERALLY PREFERRED TO INTERNAL FIXATION
PATHOLOGICAL FRACTURE FROM TUMOR

ARTHROPLASTY GENERALLY INDICATED
PAGET’S DISEASE OF BONE

[Images of X-rays showing bone structure]
OSTEOARTHRITIS OF HIP

RARE

TOTAL HIP REPLACEMENT MAY BE APPROPRIATE
RHEUMATOID ARTHRITIS

HIGHER RISK NON-UNION

67-100%
METABOLIC BONE DISEASE

HYPERPARATHYROIDISM

CHRONIC RENAL FAILURE
DELAY FROM INJURY TO SURGERY

ESPECIALLY IF MORE THAN ONE WEEK
THE FOLLOWING FACTORS ARE NOT SUFFICIENTLY ACCURATE FOR DETERMINING TREATMENT
DEGREE OF OSTEOPOROSIS

SINGH GRADE OR OTHER MEASURES OF OSTEOPOROSIS ARE NOT SIGNIFICANT
FRACTURE LEVEL

LIMITED STUDIES GIVE CONFLICTING RESULTS
PAUWELS CLASSIFICATION

RELATES THE ANGLE OF THE FRACTURE TO THE RISK OF FRACTURE HEALING COMPLICATIONS

TOTALLY USELESS IN PREDICTION OUTCOME
POSTERIOR COMMINUTION

OF QUESTIONABLE SIGNIFICANCE
CHOICE OF IMPLANT FOR INTERNAL FIXATION
CHOICE OF IMPLANT

- MULTIPLE SCREWS EQUIVALENT TO A SLIDING HIP SCREW
- MULTIPLE SCREWS BETTER THAN MULTIPLE PINS
- NOT POSSIBLE TO SAY WHICH TYPE OF SCREW IS BEST OR NUMBER OF SCREWS
SURGICAL TECHNIQUE

DISPLACED INTRACAPSULAR FRACTURES
STEP ONE

TREAT THE LIMB WITH CARE FROM ADMISSION TO SURGERY
STEP TWO

LONGITUDINAL TRACTION TO REDUCE IN AP
STEP THREE

REDUCTION IN LATERAL BY FULL INTERNAL ROTATION
FRACTURE REDUCTION

ANATOMICAL OR VALGUS ON AP
(TRABECEULAE ANGLE 160-170°)

ANATOMICAL ON LATERAL
IMPLANT POSITIONING - AP

- LOWER SCREW ON CALCAR (3 POINT FIXATION)
- ONE SCREW IN CENTRE OF FEMORAL HEAD
- AVOID SUPERIOR SEGMENT
- TIPS CLOSE TO JOINT
IMPLANT POSITION - LATERAL

- LOWER SCREW ON CALCAR (3 POINT FIXATION)
- ONE SCREW IN CENTRE OF FEMORAL HEAD
- TIPS CLOSE TO JOINT
ASPIRATION OF THE HIP?

FACT
INTRACAPSULAR PRESSURES MAY BE RAISED (>150 mmHg) DUE TO HAEMATOMA
THIS PRESSURE IS REDUCED BY ASPIRATION

THEORY
ASPIRATION OF THE HIP WILL REDUCE THE RISK OF FRACTURE HEALING COMPLICATIONS

UNPROVEN BUT POSSIBLE VALUE
NEEDLE ASPIRATION OF THE HIP

POSSIBLY HARMFUL
OPEN CAPSULOTOMY
COMPLICATIONS OF FIXATION

NON-UNION

5% OF UNDISPLACED

30 - 40% OF DISPLACED
COMPLICATIONS OF FIXATION

AVASCULAR NECROSIS

15% OF LONG TERM SURVIVORS

ONLY ONE THIRD WILL NEED SURGERY
ARTHROPLASTY

KEY DECISIONS

- SURGICAL APPROACH
- USE OF CEMENT
- UNIPOLAR, BIPOLAR, THR
SURGICAL APPROACH

GENERALLY ANTERIOR APPROACH FAVOURED AS MORE STABLE
CEMENT

THE PROSTHESIS SHOULD BE CEMENTED IN PLACE

LESS PAIN AND BETTER MOBILITY IN COMPARISON TO UNCEMENTED PROSTHESIS
UNIPOLAR VERSUS BIPOLAR

- 6 RANDOMISED STUDIES OF 742 PATIENTS SHOW NO DIFFERENCES IN OUTCOME

- RISK OF DISLOCATION IS THE SAME AS FOR UNIPOLAR PROSTHESIS

- INCREASED RISK OF OPEN REDUCTION (25-50%)

- MORE EXPENSIVE

- AT PRESENT THE USE OF BIPOLARS CANNOT BE JUSTIFIED
TOTAL HIP REPLACEMENT

- Has been reported for selected ‘fitter’ patients
- Overall good early results despite 10% dislocation rate (reduced for larger head size and anterior approach)
- Suggestion of higher long term revision rate (10-30%)
- Probably better function and less pain than hemiarthroplasty
- Likely to be use more in the future
EXTRACAPSULAR FRACTURES
TERMINOLOGY

BASAL

TROCHANTERIC
(NOT PERTROCHANTERIC)

TRANS-TROCHANTERIC
(NOT INTERTROCHANTERIC)

SUBTROCHANTERIC
CLASSIFICATION EXTRACAPSULAR

STABLE TROCHANTERIC

TRANS-TROCHANTERIC

UNSTABLE TROCHANTERIC

SUB-TROCHANTERIC
CLASSIFICATION TROCHANTERIC

JENSEN

AO

BOTH HAVE UNACCEPTABLE INTRA AND INTER OBSERVER VARIATION
CLASSIFICATION SUBTROCHANTERIC

UNACCEPTABLE INTRA AND INTER OBSERVER VARIATION
TROCHANTERIC FRACTURES (STABLE AND UNSTABLE)
SLIDING HIP SCREW

CURRENTLY THE TREATMENT OF CHOICE FOR ALL TROCHANTERIC FRACTURES

- 50+ YEARS USE
- 100+ CASE SERIES REPORTS
- 50+ RANDOMISED TRIALS
WHAT ABOUT NAILS

SLAM A GAMMA INTO YOUR GRAMMA
SHORT INTRAMEDULLARY NAILS VERSUS SLIDING HIP SCREW (SHS) FOR TROCHANTERIC FRACTURES

24 RANDOMISED TRIALS (18 GAMMA, 4 IMHS, 2 PFN) ON 3243 PATIENTS
NAILS VERSUS SHS
- OPERATIVE DETAILS

INCREASED OPERATIVE FRACTURE FEMUR

1.8% VERSUS 0.3%
NAILS VERSUS SHS
- FRACTURE HEALING

INCREASED LATER FRACTURE BELOW IMPLANT

2.7% VERSUS 0.1%
NAILS VERSUS SHS
- FRACTURE HEALING

CUT OUT OF IMPLANT
NO DIFFERENCE

2.6% VERSUS 2.4%
NAILS VERSUS SHS - FRACTURE HEALING

ALL FRACTURE HEALING COMPLICATIONS

7.5% VERSUS 3.6%
<table>
<thead>
<tr>
<th>Study or sub-category</th>
<th>Short femoral nail</th>
<th>Sliding hip screw</th>
<th>RR (fixed)</th>
<th>95% CI</th>
<th>Weight %</th>
<th>RR (fixed)</th>
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<tbody>
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<td>01 Gamma nail</td>
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<td>Goldhagen 1994</td>
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<td>0/31</td>
<td>0.75</td>
<td>1.57</td>
<td>0.41</td>
<td>0.75</td>
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<td>3.74</td>
<td>1.11</td>
<td>4.64</td>
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<td>Kuwabara 1998</td>
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<td>0.25</td>
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<td>Adams 2001</td>
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<td>0.26</td>
<td>3.12</td>
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<td>Utrilla 2005</td>
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<td>3.12</td>
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<td>Subtotal (95% CI)</td>
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<td>52</td>
<td>61.54</td>
<td>1.93</td>
<td>0.93</td>
<td>61.54</td>
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</table>

Total events: 105 (Short femoral nail), 52 (Sliding hip screw)
Test for heterogeneity: Chi² = 10.40, df = 17 (P = 0.50), I² = 0%
Test for overall effect: Z = 4.39 (P < 0.0001)

<table>
<thead>
<tr>
<th>Study or sub-category</th>
<th>Short femoral nail</th>
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<th>Weight %</th>
<th>RR (fixed)</th>
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<tr>
<td>02 Intramedullary hip screw (IMHS)</td>
<td>3/67</td>
<td>3/68</td>
<td>4.65</td>
<td>3.04</td>
<td>0.86</td>
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<td>Baumgartner 1996</td>
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<td>3/68</td>
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<td>3.04</td>
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<td>3.12</td>
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<td>Hoffmann 1999</td>
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<td>2/50</td>
<td>3.12</td>
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<td>Harrington 2002</td>
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<td>Subtotal (95% CI)</td>
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<td>224</td>
<td>14.02</td>
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<td>0.93</td>
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Total events: 18 (Short femoral nail), 9 (Sliding hip screw)
Test for heterogeneity: Chi² = 1.09, df = 3 (P = 0.78), I² = 0%
Test for overall effect: Z = 1.77 (P = 0.08)

<table>
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<tr>
<th>Study or sub-category</th>
<th>Short femoral nail</th>
<th>Sliding hip screw</th>
<th>RR (fixed)</th>
<th>95% CI</th>
<th>Weight %</th>
<th>RR (fixed)</th>
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<tr>
<td>03 Proximal femoral nail (PFN)</td>
<td>3/100</td>
<td>1/106</td>
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<td>1.52</td>
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<td>Pajarinen 2005</td>
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<td>Subtotal (95% CI)</td>
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<td>160</td>
<td>4.64</td>
<td>1.71</td>
<td>0.42</td>
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Total events: 5 (Short femoral nail), 3 (Sliding hip screw)
Test for heterogeneity: Chi² = 0.58, df = 1 (P = 0.44), I² = 0%
Test for overall effect: Z = 0.75 (P = 0.45)

<table>
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<th>Short femoral nail</th>
<th>Sliding hip screw</th>
<th>RR (fixed)</th>
<th>95% CI</th>
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<td>04 Total</td>
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<td>64</td>
<td>154</td>
<td>160</td>
<td>100.00</td>
<td>2.03</td>
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</table>

Total events: 128 (Short femoral nail), 64 (Sliding hip screw)
Test for heterogeneity: Chi² = 18.11, df = 23 (P = 0.75), I² = 0%
Test for overall effect: Z = 4.79 (P < 0.00001)
NAILS VERSUS SHS - FRACTURE HEALING

RE-OPERATIONS

5.6% VERSUS 3.5%
SHORT INTRAMEDULLARY NAILS

NO DIFFERENCE BETWEEN NAILS AND SHS FOR SEPSIS, TRANSFUSION, HOSPITAL STAY, MORTALITY, PAIN, FUNCTION

NO DIFFERENCE BETWEEN THE DIFFERENT MAKES OF SHORT FEMORAL NAIL
A NUMBER OF CASE SERIES REPORTS AND ONE RANDOMISED TRIAL OF 100 PATIENTS SUGGEST RESULTS SIMILAR TO THAT OF THE SHS
GOTFRIED PERCUTNAEOUS COMPRESSION PLATE (PCCP)

CASE SERIES REPORTS AND TWO SMALL RANDOMISED TRIALS ESSENTIALLY SIMILAR TO SHS
CONSERVATIVE TREATMENT OF TROCHANTERIC FRACTURES

POSSIBLE INDICATIONS

- UNFIT FOR ANAESTHESIA
- LACK SURGICAL FACILITIES
- LACK APPROPRIATE IMPLANT
- LACK APPROPRIATE SURGEON
- PATIENT REFUSAL
SURGICAL TECHNIQUE FOR TROCHANTERIC FRACTURES
FRACTURE REDUCTION - AP

- OSTEOTOMY
- VALGUS
- VARUS
- ANATOMICAL
MEDIAL DISPLACEMENT OSTEOOTOMY

IN CONJUNCTION WITH A SHS RESULTS IN

- INCREASED OPERATION TIME
- INCREASED BLOOD LOSS
- INCREASED RISK SEPSIS
- INCREASED FAILURE RATE
VARUS OR VALGUS
VARUS REDUCTION
VALGUS REDUCTION
SCREW POSITIONING - AP

- TRABECULAE ANGLE 165-170°
- SCREW LOW TO MIDDLE
- 5 mm FROM JOINT
FRACTURE REDUCTION - LATERAL

180°
FRACTURE REDUCTION - LATERAL
FRACTURE REDUCTION - LATERAL
SCREW POSITIONING - LATERAL

- TRABECULAE ANGLE 180°
- SCREW CENTRAL
- 5 mm FROM JOINT
ASSESSMENT OF CORRECT FIXATION

SHOULD BE LESS THAN 20mm

$$TAD = \left(X_{ap} \times \frac{D_{true}}{D_{ap}} \right) + \left(X_{lat} \times \frac{D_{true}}{D_{lat}} \right)$$
TRANS-TROCHANTERIC FRACTURES A3
CONSEQUENCES OF MEDIALISATION

- REDUCED AREA OF BONE TO BONE CONTACT
- CONSUMPTION OF LAG SCREW SLIDE
- INCREASE RISK OF FIXATION FAILURE
MEASUREMENT OF MEDIALISATION

PERCENTAGE OF MEDIALISATION IS APPROXIMATELY THE SAME AS THE RISK OF FIXATION FAILURE
FAILURES WITH MEDIALISATION OR
RECOMMENDED TREATMENT

- LAG SCREW INSERTED AT FRACTURE SITE MEASURES ABOUT 80mm
- SHORT BARREL PLATE
- OPTIMUM SCREW POSITION
- 5 HOLE PLATE
ALTERNATIVE TREATMENT?
SHORT FEMORAL NAIL

NAIL REDUCES MEDIALISATION

HOWEVER AS YET UNPROVEN IF SUPERIOR TO THE SHS
ALTERNATIVE TREATMENT?
TROCHANTERIC STABILISING PLATE

THEORETICAL ADVANTAGES FOR SELECTED FRACTURE TYPES

PLATE CLIPS TO THE SIDE OF THE FEMUR TO PREVENT MEDIALISATION
TROCHANTERIC STABILISING PLATE

AS YET OF UNPROVEN VALUE
ALTERNATIVE TREATMENT?
MEDOFF PLATE

DUAL SIDE PLATE ALLOWS COMPRESSION/COLLAPSE OF THE FRACTURE ALONG THE LONGITUDINAL AXIS OF THE FEMUR
MEDOFF PLATE

TECHNICALLY MORE DEMANDING

MAY HAVE A REDUCED CUT-OUT RATE

DEBATE WHETHER SHOULD BE ONE OR TWO WAY SLIDING
CONDYLAR SCREW OR BLADE PLATE
CONDYLAR SCREW OF BLADE PLATE

- Previous case series reported a failure rate of 8 case series
  - Sliding Hip Screw - 7%
  - Dynamic Condylar Screw - 17%
  - Blade Plate - 21%

- Two randomised trials reported better results with a nail

- Fixed nail plates should never be used for hip fractures
ARTHROPLASTY FOR TROCHANTERIC FRACTURES HAS BEEN REPORTED IN A NUMBER OF CASE SERIES REPORTS

INSUFFICIENT EVIDENCE TO SUPPORT ITS USE AT PRESENT
SUBTROCHANTERIC FRACTURES

- 5cms OF FEMUR BELOW LESSER TROCHANTER
- MAY BE PATHOLOGICAL
SHS FIXATION OF SUBTROCHANTERIC #

- STATIC FIXATION
- NO COLLAPSE AT THE FRACTURE SITE
- FIX IN ANATOMICAL POSITION
- AVOID EXCESSIVE MEDIAL DISSECTION
- BONE GRAFTING NOT NEEDED
INTRAMEDULLARY FIXATION IS PROBABLY THE BEST TREATMENT BEING LESS INVASIVE AND THE NEWER NAILS SHOULD ALLOW FULL WEIGHT BEARING
OPTIMUM MANAGEMENT OF A HIP FRACTURE
RULES OF HIP FRACTURE SURGERY

A HIP FRACTURE REQUIRES SURGICAL TREATMENT

(98% IN PETERBOROUGH)
RULES OF HIP FRACTURE SURGERY

THERE IS NO SUCH THING AS A PATIENT UNFIT FOR SURGERY, JUST PATIENTS AT HIGHER RISK THAN OTHERS.
RULES OF HIP FRACTURE SURGERY

DELAYING SURGERY IN PATIENTS WHOSE PHYSICAL STATE CANNOT BE IMPROVED IS POINTLESS
RULES OF HIP FRACTURE SURGERY

SURGERY SHOULD BE PERFORMED WITHIN 48 HOURS OF ADMISSION

94% IN MY PRACTICE
RULES OF HIP FRACTURE SURGERY

SURGERY SHOULD BE AS MINIMAL TRAUMA AS POSSIBLE AND TAILORED TO THE PATIENT’S NEED
RULES OF HIP FRACTURE SURGERY

MOBILISATION BEGINS THE DAY AFTER SURGERY WITHOUT RESTRICTIONS OR THE NEED FOR A CHECK X-RAY
RULES OF HIP FRACTURE SURGERY

REGARDLESS OF THE DEGREE OF FRACTURE COMMINUTION, CONFIGURATION OSTEOPOROSIS ETC
AFTER SURGERY ALL PATIENTS ARE MOBILISED FULLY WEIGHT BEARING
RULES OF HIP FRACTURE SURGERY

ALL FAILURES OF FIXATION ARE THE FAULT OF THE SURGEON
RULES OF HIP FRACTURE SURGERY

PATIENTS SHOULD BE DISCHARGED HOME AS SOON AS ABLE AND NOT TO ANOTHER INSTITUTION
THANK YOU