Reviewer's report

Title: Analysis of trabecular bone microstructure in osteoporotic femoral heads in human patients with proximal femoral fractures: in vivo study using multidetector row computed tomography

Version: 3
Date: 17 September 2015

Reviewer: Maria Cubria

Reviewer's report:

MAJOR COMPULSORY REVISIONS:

Abstract: (Page 3)
- Page 3 - line 3: Cite studies mentioned.
- Make sure to mention if there is IRB approval and if patients signed informed consents.
- Explain if the patients were recruited from your Institution or not.
- Mention the inclusion criteria in the methods section of the abstract.
- Include Scan parameters in the "Methods" section of the abstract.
- Describe how did you define the ROI in the apical and femoral neck areas of the femur.
- Page 3 - Line 15: " bone analysis software" Which software did you use?
- Include statistical analysis you will perform and which software will be used.
- Include p values, and confidence intervals to backup your results.
- Mention the most important results, by describing: the ROI and its specific microstructural parameters (Bone Volume Fraction, Trabecular thickness and Spacing, and Structural model index).
- Specify which ROI had the highest value in the femoral neck and apical region of the femur.
- It is not necessary to mention information from previous studies in the Discussion Section of the abstract.

Background: (Page 5)
- Page 5 – Line 15: Add citations at the end of your sentence.
- Page 5 – Line 15 & 16: “ Recently there have been reports of in vivo microstructural analysis with multidetector row computed tomography”. Which are these reports? And how is your study different from them?

Methods: (Pages 6 - 7)
- Study design must be stated in the methods section.
• Detailed Inclusion Criteria should be described. For example: If patients included sustained femoral fractures it should be described how was the femoral fracture diagnosed.
• It is not clear which types of femoral fractures are included in the study population (Intertrochanteric, neck, shaft)
• It is not clear how you defined the ROIs.
ROIs 2 and 5 are placed in the femoral neck axis, but how do you determine where ROIs 1 & 3 and 4 & 6 should be placed? Is there another measurement you made in order to make this fixed among patients? How many millimeters/centimeters parallel to the femoral neck axis did you take into account to establish ROIs 1 & 3 and 4 & 6? ROIs placement should be standardized to assure reproducibility.
• Intraclass and Interclass coefficients are calculated, but it is not mentioned how many observers will analyze the scans
• The power of the study is not mentioned.

Results: (Page 8)
• Results should include mean values and confidence intervals.
• The results should be written in a descriptive or narrative manner, and figures should be cited to back up this information.
• Confounder variables were not mentioned nor taken care of.

Discussion: (Pages 9 – 11)
• Terms such as bone quality and bone strength seem to be used as synonyms, and are not correlated with the specific parameters you studied.
• Bias is not addressed, and confounder variables are not taken care of.

Conclusions (Page 11):
• It is not clear if the conclusion of the study was that MDCT in vivo was a feasible technique to assess bone quality, or if it was related to which is the best location for screw placement based on bone quality (assessed by MDCT) in specific ROIs
• It seems to repeat findings from the result section

Figures:
• Figure 2 is not mentioned in the text
• Legends in Figures 3 – 6: repeat the study findings. Figure legends should give a clear description of the graph or table information (Variables included, units, use of brackets or symbols and their meaning). Study results shouldn’t be mentioned in here.
• Figures 3 – 6: Legends don’t explain if the symbols (*) or brackets show significant or non-significant differences
• Figures 3 – 6: Units are not included in the Y axis
DISCRETIONARY REVISIONS:
- The title could be shortened
- Page 3 - Line 3 suggestion: “Current studies recommend inferior placement of the lag screw on the anteroposterior radiograph and central placement on the lateral radiographs.”
- Page 3- Line 13 Suggestion: “mean volume to total volume” can be written as Bone Volume Fraction.
- Page 5 – Line 4: Include incidence values and trends (The ones mentioned in Page 9 – Line 4 & 5)
- Other possible confounders that were not mentioned in the exclusion criteria: bone modifying medications (bisphosphonates, thyroid hormone replacement, Hormone replacement therapy in postmenopausal women, anticonvulsants, metabolic bone diseases, smoking status)
- The study population seems to be unbalanced (2 men vs 8 women).
- A control group without femoral fractures would be useful to compare results
- Page 7 – Lines 14 to 16: Normal values and explanation of the microstructural parameters meaning could be mentioned in the results or discussion sections.
- There seems to be an explanation on how to normalize the data, but it is not clear how it was done (Page 7, Lines 21 – 24)
- Page 10 – Line 5: “Based on clinical results and biomechanical analysis” The studies you are referring to, should be cited.
- Page 10 - Lines 9 - 14: These studies are added to put your findings into context, but it is confusing as they recommend to place screws in the center or inferior part of the femoral head, but it is not specified if its in the apical area or in the femoral neck as in your study.

MINOR ESSENTIAL REVISIONS:
- Page 5 – Line 5: “After a proximal femoral fracture”
- Page 9 – Line 8: “proximal femoral fractureS are treated surgically”
- Page 9 – Line 20: “as an optimal positioning”
- Page 9 – Line 20: “These recommendations are based on”

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Needs some language corrections before being published

Statistical review: Yes, but I do not feel adequately qualified to assess the statistics.
Declaration of competing interests:

I declare that I have no competing interests’ below.