Author's response to reviews

Title: Fluoroscopic views for safe insertion of lag screws into the posterior column of the acetabulum

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Version: 6 Date: 11 August 2014

Author's response to reviews: see over
Author's response to reviews

Title: The fluoroscopic views for safe insertion of lag screws into posterior column of the acetabulum (MS: 7010858261241364)

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Version: 5 Date: 10 August 2014

Author's response to reviews: see over
Dear Editor and Reviewers:

Thank you for your positive recommendation on our work. We deeply appreciate your thoughtful and constructive comments. We have made every effort to revise our manuscript according to your suggestions. The revised version of the manuscript has been edited by two native English-speaking editors for mistakes and grammatical errors. The changes we have made are indicated below. And the changes in the manuscript appear in red.

If there is any question, we would like to make further revision accordingly.

We look forward to your reply.

Best regards,

Authors
Reviewer's report 1

Title: The fluoroscopic views for safe insertion of lag screws into posterior column of the acetabulum

Version: 5 Date: 19 June 2014

Reviewer: David Hak

Reviewer's report:

The authors have developed a verified technique to permit safe placement of percutaneous posterior column screws for the management of acetabular fractures.

This is a valuable technique that will improve patient care.

1. Thank you very much for your constructive comments and kind recommendation.

The authors are not native English language speakers, so I have taken the liberty of extensively editing their manuscript for publication. Please see the attached edited file of their paper. I would ask that the authors carefully review the edited manuscript to ensure it's accuracy.

1. We appreciate your great input into our manuscript. The English language editing is excellent and accurate. Thank you!

Level of interest: An article of outstanding merit and interest in its field

Quality of written English: Needs some language corrections before being published
The language of the manuscript was polished and edited by two native English-speaking medical editors (Csilla F. and April F.) working for American Journal Experts in addition to the kind correction and editing of Dr. David Hak.

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests: None
Reviewer's report 2

Title: The fluoroscopic views for safe insertion of lag screws into posterior column of the acetabulum

Version: 5  Date: 4 July 2014

Reviewer: D M Kahler

Reviewer's report:

To the Authors: I commend you on a good scientific approach to determining the proper radiographic angles for visualization of screw penetration during percutaneous insertion. I think you should make it clear early in the manuscript that the protocol involves the retrograde posterior column screw, rather than the more commonly placed antegrade screw; obviously, the views described could be used for both trajectories. I think the figures are good and help support the manuscript.

1. Thank you very much for your constructive comments. The protocol involving the retrograde posterior column screw has been added in the revised both Introduction and Method sections. Please see the last sentence in the Introduction section and the ninth sentence in paragraph 2 of Method section.

I would like to see more detail regarding the method of screw insertion during the experimental portion of the procedure. Were the specimens stripped of soft tissue, and was fluoroscopic guidance alone used for screw insertion? Were there any failures in inserting screws in the proper position?
Thank you very much for your constructive comments. More detail
regarding the method of screw insertion during the experimental portion
of the procedure was added in the Method and Result sections.

In the Method section: All of the specimens were stripped of soft tissue.
They were put into a radiolucent prefabricated box and placed on the
operation table in a supine position. The fluoroscopic guidance alone was
used for screw insertion. A C-arm unit (Siemens Medical, Munchen,
Germany) was used to establish the tangential views of both the PCPC
and medial wall of the acetabulum of 16 bony pelvic specimens by
referencing the unique angles $\alpha$ and $\beta$ measured on the CT images for
each specimen. The C arm was positioned according to the measured
angles (Figure 3). The angular marking on the C arm was used to confirm
the angles for the image intensifier. The intra-operative correction of the
C-arm position was not performed. A lag screw was inserted retrogradely
into the posterior column as close to the posterior cortex as possible under
the fluoroscopic guidance of the iliac oblique view and two tangential
views...........

In the Result section: The lag screws were safely inserted into the
posterior columns of the pelvic specimens ....... During the procedures,
there were no failures in inserting the screws into the proper position.
Finally, I think there should be at least some mention that surgical navigation (2D or 3D), while not available everywhere, may obviate the need for repeated imaging in multiple planes and decrease radiation exposure to both patient and surgeon.

1. Thank you very much for your constructive comments. It is very important to mention the surgical navigation in the discussion section. The sentence regarding surgical navigation has been described in the second paragraph of Discussion section.

Fluoroscopic navigation is a relatively new technique with numerous potential applications in the field of orthopaedic trauma [29]. Recently, 2-dimensional (2D) and 3-dimensional (3D) fluoroscopic navigation procedures were introduced for acetabular fracture surgery. Both navigation procedures can increase the precision of screw placement, prevent intraarticular penetration during drilling, obviate the need for repeated imaging in multiple planes and decrease radiation exposure for both the patients and surgeons [30, 31]. However, fluoroscopic navigation requires specialised equipment and instruments, and it is not available everywhere [29].

References
Editor’s Comments

General comments:

To improve clarity for the readers in understanding your work, please explicitly state each of the purposes of your study in the final paragraph of the introduction. Based on my reading of the manuscript, this may be something like:

Thus, the purposes of the present study were to 1) determine the optimal fluoroscopic angles for visualization of the posterior cortex of the posterior column and the medial wall of the acetabulum in cadaveric specimens, 2) confirm the effectiveness of these angles in ensuring intra-osseous positioning of retrograde percutaneous posterior column screws, and 3) evaluate whether fluoroscopic angles for visualization of the posterior column in human subjects are similar to those identified in cadaveric specimens.

1 Thank you very much for your constructive comments. We have revised the purposes of the current study in the final paragraph of the Introduction section according to your suggestions.

Subsequently, please structure your Results into three paragraphs, with the first paragraph presenting the only those results that address the first question listed in your revised purpose(s), second paragraph presenting those results that address the second question listed in your revised purpose(s), and so on.
Thank you very much for your constructive comments. We have restructured the Results into three paragraphs with each paragraph presenting the only results that address the corresponding question listed in the revised purposes.

In addition to providing means and SDs for measurements, it would be helpful if the authors could also include ranges for all measurements. This will provide valuable information about the maximum range of angles seen and potential for outliers.

Thank you very much for your constructive comments. The ranges for all measurements were provided. Please see the revised Results and Table 1.

The authors’ description of the optimal intra-operative fluoroscopic angles might not be intuitive for all readers to translate into actual intra-operative position. I would suggest including two diagrams, one for the alpha and one for beta angle, that would illustrate this for readers. A few examples available online that the authors could use for inspiration can be found here:

http://medicalphysicsweb.org/cws/article/research/56083, and here

http://i20.photobucket.com/albums/b249/drobin4/C-arm.jpg

Thank you for your constructive comments. Two diagrams have been provided to illustrate the intra-operative fluoroscopic angles alpha and beta. Please see Figure 3A and 3B.

Please report actual p values obtained for analyses (not just p>0.05)
Thank you for your comments. The actual p values were provided. Please see the revised Results.

I appreciate that the authors are not native English speakers, and in general the quality of the written English is reasonably good. While one of the reviewers has done a commendable job in providing several edits to the manuscript for clarity of language, I would nevertheless encourage the authors to enlist the help of a native English speaking colleague, or a native English speaking medical editor, to carefully review and edit their revised manuscript for clarity of written language prior to re-submission.

The language of the manuscript was polished and edited by two native English-speaking medical editors (Csilla F. and April F.) working for American Journal Experts in addition to the kind correction and editing of Dr. David Hak.

Specific comments:

The information presented in the first two paragraphs of the Methods should be moved to the appropriate places in subsequent paragraphs. For example, IRB statement can be moved to the end of the new first paragraph of the Methods. CT scan machine information moved to where CT scan procedure is described (ie. ?Computer tomography (CT) scans were performed on all specimens using a
commercially-available spiral 64 slice multi-detector scanner (Siemens Medical, Nuremberg?), and same for fluoroscopy machine and digital caliper information.

1. Thank you very much for your constructive comments. The information presented in the first two paragraphs of the Methods has been moved to the appropriate places in subsequent paragraphs as your commendable suggestions. IRB statement was moved to the end of the third paragraph of the Methods section.

The authors make multiple references to a “horizontal” reference line. This term should be avoided, as a horizontal line becomes vertical once the image is rotated 90 degrees. If I’m not mistaken, this line is the coronal plane. This term should be used preferentially. Was this a corrected coronal plane (ie. determined by a reference line such as the line tangential to both posterior ischial spines), or was it simply the plane tangential to the scanner table?

1. Thank you very much for your constructive comments. It is indeed improper to use the term “horizontal line”. Thanks for you pointing out this mistake. We really want to express the meaning of “the coronal plane” by using this term “the horizontal line”. However, we don’t think it is proper to say “the coronal plane” in “the axial plane”. It is the line intersecting the axial plane and the coronal plane, which can be identified by drawing a line running through the most posterior points of bilateral acetabula (Line D) or a line parallel to Line D.
Regarding the human volunteers, presumably these were recruited to confirm that the angles measured in both male and female human subjects are similar to those seen in male cadaveric specimens. This is distinct from the “feasibility of measurements”?

1. Thank you very much for your constructive comments! Just as you pointed out, the volunteers were recruited to confirm that the angles measured in both male and female human subjects are similar to those seen in male cadaveric specimens. This is distinct from the “feasibility of measurements”. We have deleted the sentence regarding the feasibility of measurement and revised this paragraph following your comments.

The first part of the fourth paragraph of the Methods should be edited for language:

To confirm that the alpha, beta and gamma angles measured in human volunteers are similar to those seen in the cadaveric specimens, human volunteers who were scheduled to undergo CT scanning of the pelvis for suspected avascular necrosis of the femoral head were recruited. Any subjects subsequently found to have evidence of femoral head pathology, bony deformity of the pelvis, or evidence of prior acetabular trauma or surgery were excluded. Fifty two volunteers were recruited and provided informed consent to participate in the study. Neither monetary nor non-monetary compensation was provided to these subjects.

1. Thank you for your comments. The first part of the fourth paragraph of the Methods has been corrected following your suggestions.
I note that all of the recruited subjects had their CT scans included in the study. Was this because they were recruited after scans were performed (ie. exclusion based on radiographic findings was performed prior to recruitment and consent), or because none of the recruited subjects were subsequently found to have AVN or any other bony pathology? Please clarify.

1. I am sorry for the confusing and too-simple description. One hundred and thirty eight volunteers who were scheduled to undergo CT scanning of the pelvis for suspected avascular necrosis of the femoral head were recruited. Eighty-six volunteers who were subsequently found to have evidence of femoral head pathology, bony deformity of the pelvis, or evidence of prior acetabular trauma or surgery were excluded. The remaining 52 volunteers were enrolled in this study and provided informed consent to participate in the study. Neither monetary nor non-monetary compensation was provided to these subjects. These have been added into the third paragraph of the Methods.

How were the fluoroscopic views established for screw insertion in the cadaveric specimens? Was the fluoroscope positioned using the average alpha and beta angles for the whole sample, or were the unique measured angles for each specimen used? How were the angles confirmed for the image intensifier (was the angular markings on the C arm used, or some other method)? Was positioning of the C arm limited to
the predicted angles, or was intra-operative correction/optimization of the C arm position performed?

1. Thank you very much for your comments. I am deeply sorry for the confusing and too-simple description in the Methods. A C-arm unit (Siemens Medical, Munchen, Germany) was used to establish the tangential views of both the PCPC and medial wall of the acetabulum of 16 bony pelvic specimens by referencing the unique angles $\alpha$ and $\beta$ measured on the CT images for each specimen. The C arm was positioned according to the measured angles (Figure 3). The angular marking on the C arm was used to confirm the angles for the image intensifier. The intra-operative correction of the C-arm position was not performed. The related information has been added into the second paragraph of the Methods.

**Editorial Requirements:**

1. Please make it clear in the method section that the screw insertion itself was only done on cadavers (not on the healthy volunteers), as it’s still not completely clear.

1. Thank you for your comments. The Method sections have been restructured, which can make the description with regard to the screw insertion more clearly. The first paragraph of the Method section described the optimal fluoroscopic angles for visualization of the posterior cortex of the posterior column and medial wall of the acetabulum in
cadaveric specimens. The second paragraph confirmed the effectiveness of these angles in ensuring intra-osseous positioning of retrograde percutaneous posterior column screws. The third paragraph evaluates the fluoroscopic angles for visualization of the posterior column in human subjects. In addition, we added a sentence in the end of the third paragraph, which reads “In the current study, the screw insertion itself was only performed on cadavers and not on the healthy volunteers”, to make it clear.

Highlight: Please highlight (with 'tracked changes'/coloured/underlines/highlighted text) all changes made when revising the manuscript to make it easier for the Editors to give you a prompt decision on your manuscript.

1. The changes made when revising the manuscript have been highlighted.

Please also ensure that your revised manuscript conforms to the journal style (http://www.biomedcentral.com/info/ifora/medicine_journals ). It is important that your files are correctly formatted.

1. Thank you for your comments. The revised manuscript has been formatted according to the required journal style.