OPEN PEER REVIEW

Open Peer Review (OPR)

As a new feature for progressing towards transparency, we decided to open a new window for all of our editors as well as authors titled "**Open Peer Review**". We hope by this new facility, our reviewers will be more motivated and authors will be more satisfied with the review process. We believe that publishing our peer review reports could make a transparent and clear environment for all our efforts within a journal, but not all reviewers tend to publish their comments.

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An "Open Peer Review" process is making the details of all review process (including reviewers, associate editors, and EICs comments) as "Public" as it is agreed by EIC, Authors, and reviewers.

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You can find out more at:
https://sites.kowsarpub.com/kowsar/knowledgebase/category/tree.html#opr.html

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Peer Review Report for "Effect of Arm Position on Image Quality and Radiation Dose in Multidetector Computed Tomography"

Author(s): Dae Cheol Kweon, Jiwon Choi

Review Timeline:

Submit Date: 11 Nov 2018
Revised Date: 6 Jun 2019
Accepted Date: 3 Jul 2019

Revision (0)

Here, you can see the **Reviewers**, **Associate Editors** and **EICs'** comments from the beginning to the end of the revision process.

REFEREE: Associate Editor | **Revision** (0) 18 Nov 2018

Dear EIC,
This is a study that analyzed Effect of Arm Position on Image Quality and Radiation Dose in Multi detector Computed Tomography.
This paper has a potential to be accepted, but some important points have to be clarified or fixed before we can proceed and a positive action can be taken.
We here summarize these points:
1- The paper should be checked with Iranian journal of radiology authors guideline.
2- The discussion is too superficial and does not refer to the vast number of major studies on the topic. Much more work needs to be done to make this section acceptable.
3- Tables: provide 95% CI. All abbreviations need to be spelled out.
4- Language edit is needed for grammar and some spelling issues.
In fact my decision is "major revision".
Best Regards

REFEREE: Reviewer | **Revision** (0) 14 Dec 2018

Dear AE,
I find this article very useful. but in my opinion there is need for more discussion coming to

making relation between CTDI and ROI used in this research.
Thanks.

REFEREE: Reviewer | **Revision (0)** 25 Dec 2018

Dear AE,
This is an interesting article about the effect of arm position on image quality in MDCT.
I did not find any problem, in the methodology or statistical analysis of the maniscript.
Thanks.

REFEREE: Reviewer | **Revision (0)** 7 Jan 2019

Dear AE,
1-Background of abstract is in fact objective. Please add background to abstract. In addition, this part of abstract is the method not objective: “A radiophotoluminescent (RPL) glass dosimetry system was used to evaluate the radiation dose and image according to the position of the arm using the phantom”
2-The authors mentioned in abstract: “To compare the radiation dose and image……” it seems they should mention image quality or something like this. Compare image is meaningless. In addition, this sentence does not have verb: “The dose of computed tomography dose index (CTDI) and dose length product (DLP) according to the position of the arm.” In aother instance, the authors mentioned: “The arms up position of CTDIvol and DLP values were lower than the arms down position.” That seems to be: “The CTDIvol and DLP values in arms up position were lower than the arms down position.” Please carefully revise the English writing of the paper.
3-Please mention abbreviations in full in the first time. For example, what is AEC?
4- Who did draw the ROI? how many evaluators did perform this task? What about their inter-rater and intra-rater reliability for this task? Please add to paper the data.
5-It is unknown how many times the experiment was repeated? If we want to compare statistically two conditions, we should compare two groups not to single condition. Please clarify in the paper that what was the number of experiments and dosimetries? How did the authors compare two different positions of arms statistically?
6- It is better the authors compare statistically the data of table 2 with each others. I mean it is better the authors compare CTDI and DLP by appropriate stat test and mention P-Value in this table. [if the data are based on a single session we can not compare them by statistics as I mentioned in the previous question]. This point is important for other tables. We should compare statistically data of a table between two different arm positions and with Z-DOM. There is no statistical comparison between these different positions. This comparison should be done for different parameters of dosimetry and image quality assessment parameters such as SD and COV……In addition, the authors mentioned they used ANOVA. Please mention where did you used ANOVA? Please mention the exact P-Values. Please compare statistically two methods and Z-DOM with each other.
7-There are two numbers for each side in table 3. This is confusing. What is the difference between them. Please explain in paper and table. [For example, there are two numbers of 856 and 1022 for left sided eye in down arms]. In addition, table legend is not appropriate, it seems it is better to say something such as: “radiation dose in different anatomical locations based on the arm position”

8-The authors mentioned: “The mean age of the patients with the thyroid gland was 16,185–22,775 µGy, 15,545–18,005 µGy with the breast, and 862–1,428 µGy with the humerus.” While the study is on the phantom and there are no data of patients here. Please describe and correct.
9-The authors mentioned: “When the phantom was raised, the artifact was not present” how did they find there is no artifact? How did they show and prove such claim?
Thanks.

REFEREE: Associate Editor | **Revision** (0) 20 Feb 2019

Dear EIC,
This is a study that analyzed Effect of Arm Position on Image Quality and Radiation Dose in Multidetector Computed Tomography.
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1- Background of abstract is in fact objective. Please add background to the abstract. In addition, this part of the abstract is the method, not objective: “A radiophotoluminescent (RPL) glass dosimetry system was used to evaluate the radiation dose and image according to the position of the arm using the phantom”
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10- The paper should be checked with the Iranian journal of radiology authors' guidelines.

11- The discussion is too superficial and does not refer to the vast number of major studies on the topic. Much more work needs to be done to make this section acceptable.

12- Tables: provide 95% CI. All abbreviations need to be spelled out.

13- Language edit is needed for grammar and some spelling issues.

Regards

REFEREE: EIC | **Revision (0)**

20 Feb 2019

Dear Author,

The reviewers' comments are mentioned. Please correct the details as mentioned above carefully according to reviewers' request.

Thanks.

OPEN PEER REVIEW

Revision (1)

Reply to Reviewers

Ideally, the reviewing process can significantly improve the submitted manuscripts by allowing the authors to take into account the advice of reviewers. Author(s) must reply to all reviewers' comments in a separate Word file, point by point. A "**Reply to Reviewers**" document is submitted along with revised manuscript during submission of revised files, summarizing the changes that the authors made in response to the reviewers' comments. The responses to reviewers' comments specifies how the authors addressed each comment the reviewers made.

You can read the authors' responses to the reviewers' comments in the next page.

Manuscript Title: Effect of Arm Position on Image Quality and Radiation Dose in Multidetector Computed Tomography

Dear Editor:

We have received with great pleasure and satisfaction your letter dated 20 February 2019, informing submission of our paper entitled **“**Effect of Arm Position on Image Quality and Radiation Dose in Multidetector Computed Tomography.”

Thank you for your feedback on our manuscript, we found these comments to be very useful and made the changes you suggested. I hope that these revisions are satisfactory.

We hope our work will meet the high standards of the **Iranian Journal of Radiology** and looking forward to hearing a positive response from you.

Thank you for your constructive comments and suggestions. We revised the manuscript as you suggested.

Reviewers' Comments:

Reviewer 1:

1. Background of abstract is in fact objective. Please add background to abstract. In addition, this part of abstract is the method not objective: “A radiophotoluminescent (RPL) glass dosimetry system was used to evaluate the radiation dose and image according to the position of the arm using the phantom”

Answer: As a reviewer points out. We corrected the objective in abstract.

In abstract: An optimization method to acquire high-quality images in CT examination by comparing the radiation dose and image according to the change in arm position and the use of the tube-current modulation method in CT examination.

2. The authors mentioned in abstract: “To compare the radiation dose and image…” it seems they should mention image quality or something like this. Compare image is meaningless. In addition, this sentence does not have verb: “The dose of computed tomography dose index (CTDI) and dose length product (DLP) according to the position of the arm.” In author instance, the authors mentioned: “The arms up position of CTDIvol and DLP values were lower than the arms down position.” That seems to be: “The CTDIvol and DLP values in arms up position were lower than the arms down position.” Please carefully revise the English writing of the paper.

Answer: We agree with the opinion of the reviewer. We have corrected objective, materials and methods, and results of abstract.

In abstract: An optimization method to acquire high-quality images in CT examination by comparing the radiation dose and image according to the change in arm position and the use of the tube-current modulation method in CT examination.

In materials and methods: The dose measured of computed tomography dose index (CTDI) and dose length product (DLP) according to the position of the arm.

In results: The CTDIvol and DLP values in arms up position were lower than the arms down position

3. Please mention abbreviations in full in the first time. For example, what is AEC?

Answer: We agree with the opinion of the reviewer. We have corrected results of abstract.

In results: automatic exposure control (AEC)

4. Who did draw the ROI? How many evaluators did perform this task? What about their inter-rater and intra-rater reliability for this task? Please add to paper the data.

Answer: We have drawn the ROI directed from the phantom image for radiological technologist (in Fig. 1). Data added in the Table 5.

In Image Quality Analysis: The radiological technologist who carried out the research drew the ROI directly from the anthropomorphic phantom image.

Table 5. Comparison of mean, SD, minimum, maximum and COV calculated for different arm position and AEC system

Parameter	Position	Mean	SD	Minimum	Maximum	COV (%)
Both Arms Raised (Z-DOM)	Heart	−6.14	8.39	−25	16	−136.64
	Chest	−20	9.3	−45	3	−46.5
	Lung	−993.68	5.48	−1008	−980	−0.55
	Bone	341.92	148.91	215	8610	43.55
Both Arms Raised (Fixed tube current)	Heart	−2.58	4.81	−19	9	−186.43
	Chest	−21	9.4	−44	−4	−44.76
	Lung	−994.24	4.14	−1005	−983	−0.41
	Bone	393.98	151.17	18	810	38.36
Both Arms Down	Heart	−13.73	51.82	−132	55	−377.42
	Chest	−13.9	22.96	−62	27	−165.17
	Lung	−995.66	10.52	−1019	−967	−1.05
	Bone	342.5	163.87	−5	885	47.84

5. It is unknown how many times the experiment was repeated? If we want to compare statistically two conditions, we should compare two groups not to single condition. Please clarify in the paper that what was the number of experiments and dosimetries? How did the authors compare two different positions of arms statistically?

Answer: We conducted the experiment was carried out under two conditions of arms up and down as shown in Fig. 2 and materials and methods. In this way, we compared the image and radiation dose (CTDIvol, DLP and RPL) under two conditions.

6. It is better the authors compare statistically the data of table 2 with each others. I mean it is better the authors compare CTDI and DLP by appropriate stat test and mention P-Value in this table. [if the data are based on a single session we can not compare them by statistics as I mentioned it in previous question]. This point is important for other tables. We should compare statistically data of a table between two different arm positions and with Z-DOM. There is no statistical comparison between these different positions. This comparison should be done for different parameters of dosimetry and image quality assessment parameters such as SD and COV… In addition, the authors mentioned they used ANOVA. Please mention where did you used ANOVA? Please mention the exact P-Values. Please compare statistically two methods and Z-DOM with each other.

Answer: Reviewer said right. In results: By reviewing the feedback of the reviewer. We found a significant radiation dose between both arms raised and down ($p < .05$). We modified the table by inserting *p*- value.

Table 2. CTDI and DLP

	Both Arms Raised	Both Arms Down	*p*-value
$CTDI_{vol}$ (mGy)	7	11.6	0.000
DLP (mGy·cm)	264.61	436.39	0.000

In statistical analysis: An unpaired Student's t-test in SPSS PC + version 20 (IBM, Chicago, USA) was used to compare the continuous values such as CTDIvol, DLP between both arms and raised in the anthropomorphic phantom. Comparisons between eye, thyroid, breast and humerus for four radiation dose datasets was Statistical analysis was performed using one-way analysis of variance (ANOVA) in SPSS PC + version 20 (IBM, Chicago, USA), and compared to the 95% confidence interval for the HU of the standardized CT, the difference was analyzed. Post analysis was performed without assuming the same distribution using the Dunnett's post-hoc test. Statistical significance of the data was analyzed when the *p*-value was less than 0.05.

7. There are two numbers for each side in table 3. This is confusing. What is the difference between them. Please explain in paper and table. [For example, there are two numbers of 856 and 1022 for left sided eye in down arms]. In addition, table legend is not appropriate, it seems it is better to say something such as: "radiation dose in different anatomical locations based on the arm position"

Answer: We modified the legend of the table and the left and right and of positions to write the table.

Table 3. Radiation dose in different anatomical locations based on the arm position (μGy)

No.	Region	Position	Both Arms Down	Both Arms Raised
1	Eye	Left	856	421
2			1,022	538
3		Right	791	445
4			768	643
5	Thyroid	Left	21,595	20,895
6			24,455	16,185
7		Right	20,855	18,455
8			24,685	22,775
9	Breast	Left	18,855	15,545
10			21,045	17,425
11		Right	19,365	17,555
12			20,765	18,005
13	Humerus	Left	12,405	862
14			12,455	1,060
15		Right	9,197	1,235
16			10,535	1,428

8. The authors mentioned: "The mean age of the patients with the thyroid gland was 16,185–22,775 μGy, 15,545–18,005 μGy with the breast, and 862–1,428 μGy with the humerus." While the study is on the phantom and there are no data of patients here. Please describe and correct.

Answer: In results revised below follows.

In results: Radiation dose in different anatomical locations based on the arm position with thyroid gland were 16,185–22,775 μGy, breast were 15,545–18,005 μGy and humerus position calculated were 862–1,428 μGy.

9. The authors mentioned: "When the phantom was raised, the artifact was not present" how did they find there is no artifact? How did they show and prove such claim?

Answer: In results and Fig. 4 and 5. We did not have the artifacts of the image when the hands were elevated and CT scanned as shown in Figures 4 and 5.

Reviewer 2:

I find this article very useful. But in my opinion there is need for more discussion coming to making relation between CTDI and ROI used in this research

Answer: We compared image quality of SNR, PSNR, RMSE and radiation dose for scanned anthropomorphic phantom. The anthropomorphic phantom scanned ROIs showed no significant difference (p >.05) compared to the four images (heart, lung, chest, and bone), but there was a significant difference in radiation dose of CTDIvol, DLP and RPL (p <.05).

Reviewer 3:

This is an interesting article about the effect of arm position on the image quality in MDCT. I did not find any problem, in the methodology or statistical analysis of the manuscript.

Answer: Thank you for your review.

Associate Editor's Comments:

Associate Editor 1:

This is a study that analyzed Effect of Arm Position on Image Quality and Radiation Dose in Multi detector Computed Tomography. This paper has a potential to be accepted, but some important points have to be clarified or fixed before we can proceed and a positive action can be taken.

We here summarize these points:

1. The paper should be checked with Iranian journal of radiology authors guideline.

Answer: We revised the paper by referring to the guidelines of the Iranian Journal of Radiology.

2. The discussion is too superficial and does not refer to the vast number of major studies on the topic. Much more work needs to be done to make this section acceptable.

Answer: We are in discussion. In order to compare the radiation dose (CTDIvol, DLP and RPL) and the image measured in CT scan, we cited references 6, 11, and 10-20 and compared it with our paper.

3. Tables: provide 95% CI. All abbreviations need to be spelled out.

Answer: We have added the abbreviations pointed out by the reviewer to the Table 4 and 5.

Table 4. Image analysis of arm position and dose modulation

	SNR	PSNR (dB)	RMSE	MAE
Both Arms Raised vs Both Arms Down	12.59	13.24	202.85	71.10
Z-DOM vs Fixed Tube Current	37.56	38.21	11.44	7.04

Note. SNR = Signal-to-noise ratio, PSNR = Peak signal-to-noise ratio, RMSE = Root mean square error, Z-DOM = z-axis thickness modulation

Table 5. Comparison of mean, SD, minimum, maximum and COV calculated for different arm position and AEC system

Parameter	Position	Mean	SD	Minimum	Maximum	COV (%)
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	Lung	−995.66	10.52	−1019	−967	−1.05
	Bone	342.5	163.87	−5	885	47.84

Note. SD = Standard deviation, COV = Coefficient of variation

4. Language edit is needed for grammar and some spelling issues.

Answer: We corrected the English paper by referring to the opinion of the reviewer.

In fact my decision is "major revision".

Answer: Thank you for reviewing my paper.

Associate Editor 2:

Dear editor in chief

This is a study that analyzed Effect of Arm Position on Image Quality and Radiation Dose in Multi detector Computed Tomography. This paper has a potential to be accepted, but some important points have to be clarified or fixed before we can proceed and a positive action can be taken.

We here summarize these points:

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Answer: As a reviewer points out. We corrected the objective in abstract.

In abstract: An optimization method to acquire high-quality images in CT examination by comparing the radiation dose and image according to the change in arm position and the use of the tube-current modulation method in CT examination.

2. The authors mentioned in abstract: “To compare the radiation dose and image…” it seems they should mention image quality or something like this. Compare image is meaningless. In addition, this sentence does not have verb: “The dose of computed tomography dose index (CTDI) and dose length product (DLP) according to the position of the arm.” In author instance, the authors mentioned: “The arms up position of CTDIvol and DLP values were lower than the arms down position.” That seems to be: “The CTDIvol and DLP values in arms up position were lower than the arms down position.” Please carefully revise the English writing of the paper.

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In results: automatic exposure control (AEC)

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Answer: We have drawn the ROI directed from the phantom image for radiological technologist (in Fig. 1). Data added in the Table 5.
In Image Quality Analysis: The radiological technologist who carried out the research drew the ROI directly from the anthropomorphic phantom image.

5. It is unknown how many times the experiment was repeated? If we want to compare statistically two conditions, we should compare two groups not to single condition. Please clarify in the paper that what was the number of experiments and dosimetries? How did the authors compare two different positions of arms statistically?
Answer: We corrected it by referring to what the reviewers pointed out. We measured the ROI and compared the quality of the images. We describe the modifications to the quality analysis of materials and methods of imaging.
In Image Quality Analysis: The radiological technologist who carried out the research drew the ROI directly from the anthropomorphic phantom image. The examiner measured the 4 portions (heart, chest, lung, and bone) of each 3 times on each of the anthropomorphic phantom.

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Answer: In results revised below follows.

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	Lung	−994.24	4.14	−1005	−983	−0.41
	Bone	393.98	151.17	18	810	38.36
Both Arms Down	Heart	−13.73	51.82	−132	55	−377.42
	Chest	−13.9	22.96	−62	27	−165.17
	Lung	−995.66	10.52	−1019	−967	−1.05
	Bone	342.5	163.87	−5	885	47.84

Note. SD = Standard deviation, COV = Coefficient of variation

13- Language edit is needed for grammar and some spelling issues.

Answer: We corrected the English paper by referring to the opinion of the reviewer.

OPEN PEER REVIEW

Revision (1)

Here, you can see the **Reviewers**, **Associate Editors** and **EICs'** comments from the beginning to the end of the revision process.

REFEREE: Reviewer | **Revision** (1) — 10 May 2019

Dear AE
The manuscript is acceptable now, due to solving of mentioned issues.
Best Regards

REFEREE: Reviewer | **Revision** (1) — 25 May 2019

Dear AE,
The study is reviewed carefully. According to comments and revisions by the author, this manuscript is accepted.
Thanks

REFEREE: Associate Editor | **Revision** (1) — 8 Jun 2019

Dear EIC
Based on the authors' answers to the reviewers' comments, the reviewer(s) have recommended publication.
Kind regards.

REFEREE: Associate Editor | **Revision** (1) — 23 Jun 2019

Dear EIC,
The authors should respond to all comments one by one.
1- In the abstract, please change the background. This background seems like objectives.
2- In Table 1, what does YA stand for?
3- In Table 4, what does MAE stand for?
Thank you.

REFEREE: EIC | **Revision** (1) — 23 Jun 2019

Dear Author,
Your article is reviewed by the reviewers carefully. According to their comments, this document needs minor revision. Please follow their comments as requested.
Thanks.

OPEN PEER REVIEW

Revision (2)

Reply to Reviewers

Ideally, the reviewing process can significantly improve the submitted manuscripts by allowing the authors to take into account the advice of reviewers. Author(s) must reply to all reviewers' comments in a separate Word file, point by point. A "**Reply to Reviewers**" document is submitted along with revised manuscript during submission of revised files, summarizing the changes that the authors made in response to the reviewers' comments. The responses to reviewers' comments specifies how the authors addressed each comment the reviewers made.

You can read the authors' responses to the reviewers' comments in the next page.

Manuscript Title: Effect of Arm Position on Image Quality and Radiation Dose in Multidetector Computed Tomography

Dear Editor:

We have received with great pleasure and satisfaction your letter dated 24 June 2019, informing submission of our paper entitled **"**Effect of Arm Position on Image Quality and Radiation Dose in Multidetector Computed Tomography."

Thank you for your feedback on our manuscript, we found these comments to be very useful and made the changes you suggested. I hope that these revisions are satisfactory.

We hope our work will meet the high standards of the ***Iranian Journal of Radiology*** and looking forward to hearing a positive response from you.

Thank you for your constructive comments and suggestions. We revised the manuscript as you suggested.

Reviewers' Comments:

Associate Editor 2:

Dear author,

Please respond to all comments one by one. Then, highlight any changes you make in the manuscript. Please do not make any changes in the manuscript other than responding to the comments, because they will not be considered.

Answer: Thank you for reviewing manuscript. We revised the paper by referring to the guidelines of the Iranian Journal of Radiology.

1. In the abstract, please change background. This background seems like objectives.

Answer: As a reviewer points out. We corrected the background in abstract. In background of abstract revised below follows.

In abstract

Background: Abdominal CT using a tube-current modulation technique may result in artifacts due to changes in the position of the patient's arms, resulting in poor image quality and excessive radiation exposure. To solve these problems, the patient's arm is positioned mainly on the head or outside the examination area.

2- In Table 1, what does YA stand for?

Answer: We have modified YA in the Table1. Y-sharp (YA) strand for filter and convolution kernel

Table 1. CT scanning parameters

Parameters	Description or Value
Tube voltage (kV)	120
Tube-current modulation	Z-DOM
Slice thickness (mm)	3
Beam collimation (mm)	64 × 0.625
Image matrix (rows and columns)	512 × 512
Pitch	0.89
Field of view (mm)	350.0
Rotation time (s)	0.75
Table feed (mm/s)	47.5
Slice increment (mm)	3.00
Filter type	Y-sharp (YA)
Convolution kernel	Y-sharp (YA)

3-In Table 4, what does MAE stand for?

Answer: We have inserted of MAE: Mean absolute error in the Table 4.

Table 4. Image analysis of arm position and dose modulation

	SNR	PSNR (dB)	RMSE	MAE
Both Arms Raised vs Both Arms Down	12.59	13.24	202.85	71.10
Z-DOM vs Fixed Tube Current	37.56	38.21	11.44	7.04

Note. SNR: Signal-to-noise ratio, PSNR: Peak signal-to-noise ratio, RMSE: Root mean square error, Z-DOM: z-axis thickness modulation and MAE: Mean absolute error

OPEN PEER REVIEW

Revision (2)

Here, you can see the **Reviewers**, **Associate Editors** and **EICs'** comments from the beginning to the end of the revision process.

REFEREE: Associate Editor | **Revision** (2) 3 Jul 2019

Dear EIC
Based on the authors' answers to the reviewers' comments, the reviewer(s) have recommended publication.
Kind regards.

REFEREE: EIC | **Revision** (2) 3 Jul 2019

Dear Author,
The document is reviewed carefully by the reviewers. According to their comments and your revisions as requested, this manuscript is accepted.
Thanks.