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OPEN PEER REVIEW

A Study of Fixed Current and Automatic Tube Current Modulation at a Fixed Low Tube Voltage in Low-dose Computed Tomography (CT) Imaging of Infant Lungs

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About this report

This open peer review (OPR) report shows the public comments made on this article during peer review, by the reviewers, the associate editor and the editor-in-chief, for every revision round, together with the authors' replies. Comments appear only with the consent of the people who wrote them. Reviewers who chose to sign their report are named; the others are shown as "Referee". Comments are edited for language only, and confidential remarks to the editors are not included.

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1 Original submission

1 comment · 12 Jun 2022

Editor-in-Chief

MINOR REVISION 12 Jun 2022

Dear authors,
Before starting the review process for your article, it is necessary to clarify the following items:

Given the importance of clarifying conflicts of interest, the corresponding author should fill out the “ICMJE form” and upload it during the submission process. (The form is available in the “conflict of interest” section of the site: https://brief.land/iranjradiol/knowledgebase/category/tree.html#conflicts_of_interest.html).

Please clarify the funding source and provide the grant number with its link, or upload the official grant approval number.
Regards

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Revision 1

AUTHORS' RESPONSE TO REVIEWERS

Authors' reply to reviewers

The next pages contain the authors' point-by-point reply to the comments of this revision round, as submitted with the revised manuscript. It is published as the authors wrote it.

Response letter

Dear Editor:

We are truly grateful for the critical comments and thoughtful suggestions from you and the reviewers. Based on these comments and suggestions, we have made careful modifications to the original manuscript. All changes made to the text are shown in red. We hope that the new manuscript will meet your journal's standards. Below, you will find our point-by-point responses to the reviewers' questions:

1. Tables are not inserted in the text correctly (or you have forgotten to mention one or more tables in the article body). Please mention / insert the Table(s) in the text consecutively.

It has been added.

2 Revision 1

2 comments · 31 Jul 2022 – 27 Aug 2022

Referee 1 Reviewer

MINOR REVISION 31 Jul 2022

Thanks to the authors for their submission to the IJR.
Generally, this manuscript is relatively appropriate in terms of scientific writing, but it needs some revisions as follows:
1. The abstract and full text must be written according to the IJR guidelines.
2. It would be better to mention the comparison group in the study title.
3. According to the study objective and the description of study participants in the full-text method section, the study design is a clinical trial because two groups are assigned to two different diagnostic techniques. Why was randomization not used to adjust for possible confounding effects on the group comparison? Is this study protocol registered in any trial registration database? If so, the registration code must be added in the ethical consideration section.
4. Why were age strata used for comparison between the two methods? This must be clarified in the method section.
5. In statistical analysis:
5.1. Full details of SPSS must be added.
5.2. Replace measurement data with continuous data.
5.3. Was matching for age and sex used at the study design stage? If so, their frequencies are similar between groups, and comparing them is not logical.
6. Tables:
6.1. It would be better to reverse the columns and rows.
6.2. There is a similar study entitled "Evaluation of chest CT scan in low-weight children with ultralow tube voltage (70kVp) combined with Flash scan technique" that can be used as a template for the scientific writing structure of the methods and the presentation of results.
6.3. The critical value of the test should not be presented in the table, but a p-value must be added for every variable, such as sedation needed in table 1.

Editor-in-Chief

MAJOR REVISION 27 Aug 2022

Dear authors,
Your article needs Major Revision.
Regards

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Revision 2

AUTHORS' RESPONSE TO REVIEWERS

Authors' reply to reviewers

The next pages contain the authors' point-by-point reply to the comments of this revision round, as submitted with the revised manuscript. It is published as the authors wrote it.

Response letter

Dear Editor:

We are truly grateful for the critical comments and thoughtful suggestions from you and the reviewers. Based on these comments and suggestions, we have made careful modifications to the original manuscript. All changes made to the text are shown in red. We hope that the new manuscript will meet your journal's standards. Below, you will find our point-by-point responses to the reviewers' questions:

Reviewer 1:

1- There are two abstracts (pages 1-2 and page 4). The first one is larger and more detailed with references. The second seems to be more suitable for the structure of the article.

The question has been modified.

2- In the Materials and Methods it is not clear that all patients had two or more phases of CT scanning in pre and post contrast acquisitions, and that the new method was applied to which one. Please clarify with a better English.

The question has been modified.

During January to December 2019 ,90 infants (47 males, 43 females) with a mean age of 1.9±0.2 years who came to the department from 0-3 years of age for chest

enhancement CT due to their medical condition were randomly collected in experimental group ,90 infants for chest CT were randomly collected in control group. Both the experimental and control groups were divided into 3 groups according to age: 0-≤1 years, 1-≤2 years and 2-≤3 years, with 30 patients in each group.(Because the developmental conditions of infants under the age of 3 are very different , different height and weight led to different X-ray absorption capabilities and image quality vary greatly, to reduce the influence of body size on the experimental data, they were grouped by age,the radiation dose and image quality were compared in the same age group) . The plain scan period of the enhanced examination was the experimental group with 80 kV and fixed tube current 30 mAs , the enhancement period was conventional condition 80 kV and automatic tube current (30-150 mAs). In the control group, the condition was 80 kV and automatic tube current (30-150 mAs) for conventional conditions. The dose index (DRI) was 8 for 0-≤1-year-olds and 9 for 1-≤3-year-olds[3, 5].

3- In line 71, please use percentile instead of P.

The question has been modified.

infants with a body mass index of 5%<BMI<95%

4- Please explain the reason of exclusion criteria and how they could be understood before imaging.

Massive pneumothorax reduced X-ray absorption. Pleural effusion, lung

consolidation and large substantial tumors increased X-ray absorption. Severe thoracic deformity, X-ray absorption increased or reduce. So excessive measurement deviation due to physical reasons of the infants were excluded, which would affect the accuracy of the experimental data.After scanning the positioning image, made a diagnosis on the positioning image,If the above lesions were present, they were not included in the experiment.

Iodine contrast can aggravate the metabolic functions of the cardiac, hepatic and renal, and exacerbate the condition of infants with severe cardiac, hepatic and renal insufficiency. Enhanced CT scans were prohibited, therefore, these infants were excluded.

In order to prevent the occurrence of allergic reactions in infants allergic to iodine, enhanced CT scans were prohibited, therefore, these infants were excluded.

Infants who have undergone enhanced CT or have been infused with

iodine contrast within 14 days will aggravate renal metabolic function and may cause renal dysfunction if iodine contrast is injected again. Enhanced CT scans were prohibited, therefore, these infants were excluded.

When signing the informed consent form with the infants caregivers, it is clear whether the infants have severe cardiac, hepatic and renal insufficiency, are allergic to iodine, had undergone enhanced CT within 14 days or have been infused with iodine contrast agent, and if so, inform that enhanced CT cannot be performed.

5- line 81: the plain scan period in the enhanced examination (or non-enhanced examination ?)

The enhanced examination.

6- Line 91-93: As there is no explanation about iDose⁴ technique, the reader cannot understand the postprocessing with 3-level lung window or the image weighting for the lung window was level 4.

The question has been modified.

All images were reconstructed with iDose⁴ technology, on the lung window, the reconstruction level was 3 for 0-≤1 years and 4 for 1-≤2 years and 2-≤3 years.(The recon mode in reconstruction has 1-7 levels, the image noise decreases with the increase of the reconstruction level, as the SNR and image quality increases. However, after reaching the optimal reconstruction level, the image clarity will decrease with the increase of the reconstruction level, and the edges of the image will become blurred, and different age reconstruction levels have different effects on the image quality.) [3, 5].

7- Line 99, a brief definition of image noise is needed (for example: standard deviation (SD) of pixel values from uniform image regions).

The question has been modified.

the SD (SD, standard deviation of pixel values from uniform image regions) of the image noise values

8- Line 109-118: more concise with a better English (about 5 point scale).

The question has been modified.

5 points, the anatomical structures and lesions were clear and good contrast without artifacts or noise.4 points, anatomical structures and lesions with few artifacts or noises. 3 points, adequate image quality for

interpretation with mild artifacts or noise.2 points, image quality partial impairment of diagnostic accuracy duo to severe artefacts or noise.1 point, image quality marked impairment of diagnostic accuracy with severe artefacts or noise.

9- Line 121: please explain: "Gender was tested by the chi-square test."

Different genders have different developmental conditions at the same age, different height and weight, different X-ray absorption capabilities, and different radiation doses under the same conditions. Excessive differences in gender distribution between the experimental group and the control group will affect the comparison of radiation doses, and the experimental data are not scientific.Chi-square test is used to test whether there is a difference between categorical variables, so it is used to analyze the gender differences between the two groups.

10- Line 136: CTDLvol should be CTDIvol

The question has been modified.

The CTDIvol, DLP and ED in the same age group were statistically significant differences between the experimental and control groups ($p<0.05$).

11- In the first paragraph of discussion, please explain the effect of tube voltage in your study and why it is selected as 80 kV (Chinese Medical Association recommends that the scanning conditions for LDCT should be 100-120 kV).

We had explain the effect of tube voltage in the first paragraph of discussion.

Chinese Medical Association recommends that the scanning conditions for LDCT should be 100-120 kV are for adults , but the bodily form of infants are much smaller than adults ,the tube voltage should be decrease, In China, many studies have shown that 80KV can be used for chest CT examination of infants (e.g., Reference 5) , therefore in this study it is selected as 80 kV .

12- Line 197: reconstruction

The question has been modified.

Some studieshave confirmed that iterative reconstruction using iDose4 can be applied to low-dose CT scans.

Reviewer 2:

1. Abstract and full-text must be written based on IJR guideline.

The question has been modified.

2. It is better that mentioned to the comparison group in the study title

The question has been modified.

The question has been modified.

Study of fixed current and automatic tube current under low fixed tube voltage in low-dose CT scan of infant lung

3. According to study objective and description od study participants in full-text method, the design of study is clinical trial. Because, two group assign to the two different diagnostic technique. Why not used of randomization for adjustment of possible confounding effect on group comparison? Is this study protocol registered in any trial registration data base? If so, the code of registration must be added in ethical consideration section.

We had modified the design of study to clinical trial.

Because infants collected of the experiment group were for chest enhancement CT , the control group were for chest CT. The inclusion

criteria of the two groups was diffrence ,so in this study had not use randomization on group comparison. But the selection of infants in each group was random.

This study had registered in Chinese Clinical Trial Regisry.The regidtration number was ChiCTR2200065449.

4. Why used of age groups strata for comparison between two method? It must be clarified in method.

Because the developmental conditions of infants under the age of 3 are very different , different height and weight led to different X-ray absorption capabilities and image quality vary greatly, to reduce the influence of body size on the experimental data, they were grouped by age,the radiation dose and image quality were compared in the same age group.

5. In statistical analysis:

5.1. Full characteristics of SPSS must be added.

The question has been modified.

IBM SPSS Statistics 25.0 (IBM Corp., New York, NY; formerly SPSS Inc., Chicago, IL) was used in this study.

5.2. Measurement data replace by continuous data.

Measured ROI three times at the same position and the average value was taken.

5.3. Did used of matching for age and sex in the designing stage of study? If so, their frequency is similar between groups, and their comparison is not logical.

We did not used of matching for age and sex in the designing stage of study.

6. Tables:

6.1. It is better that the columns and rows must be reversed.

The question has been modified.

6.2. There is a similar study entitled as "Evaluation of chest CT scan in low-weight children with ultralow tube voltage (70kVp) combined with Flash scan technique" can be used as template for scientific writing structure of methods and results presentation.

We had modified the structure of methods and results from the template study.

6.3. Critical value of test should not presented in the table, but p-value must be added for every variable such as sedation needed in table 1.

The question has been modified.

3 Revision 2

2 comments · 21 Nov 2022 – 17 Dec 2022

Referee 1 Reviewer

ACCEPT 21 Nov 2022

Thanks to the authors for the appropriate revision.
Currently, this manuscript is suitable for publication in IJR.

Editor-in-Chief

MAJOR REVISION 17 Dec 2022

Dear authors,
Your article needs Major Revision.
Regards

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Revision 3

AUTHORS' RESPONSE TO REVIEWERS

Authors' reply to reviewers

The next pages contain the authors' point-by-point reply to the comments of this revision round, as submitted with the revised manuscript. It is published as the authors wrote it.

Response letter

Dear Editor:

We are truly grateful for suggestions from you and the reviewers. Based on these comments and suggestions, we have made careful modifications to the original manuscript. All changes made to the text are shown in red. We hope that the new manuscript will meet your journal's standards. Below, you will find our point-by-point responses to the reviewers' questions:

Material and method:

-The characteristics of experimental and control CT scans are vague. In the manuscript you used the terms "chest enhancement CT" and "enhanced examination" for experimental group.

Did both experimental and control groups include chest CT scans with and without IV contrast? How did you compare the quality of the images and the imaging parameters by considering IV contrast effect?

-All the comparing images are without IVcontrast

How about contrast enhanced CT scans?

The experimental group were the plain scan of the chest enhancement CT (included plain scan and arterial scan).

The control group were the plain scan of the chest non-enhancement CT, only plain scan were included.

4 Revision 3

1 comment · 14 Jan 2023

Editor-in-Chief

MINOR REVISION 14 Jan 2023

Dear authors,
Your article needs Minor Revision.
Regards

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Revision 4

AUTHORS' RESPONSE TO REVIEWERS

Authors' reply to reviewers

The next pages contain the authors' point-by-point reply to the comments of this revision round, as submitted with the revised manuscript. It is published as the authors wrote it.

Response letter

Dear Editor:

We are truly grateful for suggestions from you and the reviewers. Based on these comments and suggestions, we have made careful modifications to the original manuscript. All changes made to the text are shown in red. We hope that the new manuscript will meet your journal's standards. Below, you will find our point-by-point responses to the reviewers' questions:

Reviewers' Comments:

Please rewrite the abstract based on the structure outlined in the journal, which is related to research articles studies. Abstract of research articles should comprise the below sections:
• Background
• Objectives
• Patients and Methods
• Results
• Conclusion

The question has been modified.

It is better for the authors to write captions of A, B, C, … for different parts of images of Figure 2 in sequential order. (for example, a, b, c were lung windows aged 0-1 years,.....)

The question has been modified.

Associate Editor's Comments:

Associate Editor 2:

1-please add a very brief part ss background to abstract according to journal format]

The question has been modified.

2-this part is unclear: “Ninety infants aged 0-3 years for chest enhancement CT included plain scan and arterial scan were randomly collected ” in addition, this sentence seems unclear: “However the radiation dose to the lungs will increase due to the enhanced attenuation coefficient when using the automatic tube current technique in infants aged 0-3 years due to differences in tissue development”

The question has been modified.

3-please add objective part to the paper before method section according to journal format.

The question has been modified.

4-please change Materials and Methods to patients and methods.

The question has been modified.

5-please add sequential numbers to title and sub-titles

The question has been modified.

6-this part is better to be re-written: “During January to December 2019 ,90 infants from 0-3 years of age for chest enhancement CT included plain scan and arterial scan due to their medical condition were randomly collected, the plain scan of chest enhancement CT were the experimental group ,90 infants from 0-3 years of age for chest non-enhancement CT were randomly collected in control group.”

The question has been modified.

7-please correct this part: “Both the experimental and control groups were divided into 3 groups according to age: age ≤1 years, 1< age ≤2 years, 2< age ≤3 years.”

The question has been modified.

8-please correct: “Inclusion criteria were as follows”. And “Sedation method was as follows:”

The question has been modified.

9-is this part correct: “Bracco Injeneering”?

Bracco Injeneering S.A. is the name of the manufacturer.

10-what is “recon” in line 75?

Recon mode is a name of the reconstruction level interface in Philips

Brilliance 256-layer ICT.

11-it is better the authors introduce full term of abbreviations in the first time of usage [in abstract and paper separately] for example SNR in line 76

The question has been modified.

12-please correct Hounsfifield in line 87.

The question has been modified.

13-in line 93, please correct “signal to noise ratio (SNR)” I think this full term hould be mentioned in line 76 and here only we need SNR.

The question has been modified.

14-line 95; this part is unclear: lung window 1400 HU, -450 HU. Why two different HUs?
1400 HU is window width , -450 HU is window centre.
15-in line 96, this part is unclear: or above for each group.

The question has been modified.

16-please add manufacturer data of SPSS based on:
https://www.ibm.com/support/pages/how-cite-ibm-spss-statistics-or-earlier-versions-spss

The question has been modified.

17-the authors mentioned: “In the 0-1-year-old group, the experimental group included 17 males and 13 females (age :1.9±0.2 years, BMI :16.71±1.78) and the control group included 16 males and 14 females (age :1.9±0.2 years, BMI :17.54±1.52).” this part is wrong. In infants with an age lower than 1 year, mean age could not be 1.9 years. In addition, please add unite of BMI. The same problem could be seen for patients 2< <3 years old as they mean age should be between 2 and 3 years [not 1.9]

The question has been modified.

18-in line 132, please replace were with showed

The question has been modified.

19-in line 149, there is a sentence without verb: “Reconstructed images of iDose⁴ in different age groups of the experimental group and control group (Fig. 2)” please clarify.

The question has been modified.

20-in line 173, please correct: “studies have”

The question has been modified.

21-what is CTDIw in line 215?

The question has been modified.

22-in line 220, Shortcomings of this study were as follows

The question has been modified.

23-it is better the authors change all “were” to “are” in figure 2 legend. [present tenses are better than past tenses]

The question has been modified.

24-please add full term of abbreviations in the footnote of table 2 [CTDI, DLP, ED]

The question has been modified.

25-P-values in table 2 are 0. Please correct [maybe, authors can write them as <0.001] [please apply similar correction in table 3]

The question has been modified.

25-please complete the table 2, 3 and 5 footnote as: the data have been mentioned as (X ± SD ,n=30)

The question has been modified.

26-Please rewrite the abstract based on the structure outlined in the journal, which is related to research articles studies. Abstract of research articles should comprise the below sections:

• Background
• Objectives
• Patients and Methods
• Results
• Conclusion

The question has been modified.

5 Revision 4

1 comment · 25 Feb 2023

Editor-in-Chief

ACCEPT 25 Feb 2023

Dear authors,
Your article is acceptable for publication in IJR.
Regards