Author’s response to reviews

Title: Surgical factors affecting oculocardiac reflex during strabismus surgery

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Reviewer reports:

Vivek Warkad (Reviewer 1): I re-read the manuscript written by Dr Suk-Gyu Ha titled as "Surgical factors affecting oculocardiac reflex during strabismus surgery" with a great interest

Review Comments:

I appreciate author efforts to correct the last review though I have one comment to make conclusion better

1-1 Line 222-223: I would suggest author to reconstruct sentence in conclusion. Please replace these two sentence "It should be considered while operating first extra ocular muscle in strabismus surgery. Surgeon needs to be more careful about during strabismus surgery", by "Surgeon needs to be more careful while operating first extraocular muscle in strabismus surgery"

Thank you for your comment. We have revised the manuscript as you pointed out.
Robert Wendell Arnold, MD (Reviewer 2): Major Comments:

Muscle traction amount and time are VERY IMPORTANT in this study.

The main conclusion of this study was that first muscle EOM tension caused more >20% bradycardia than the subsequent surgery.

Hidden within the data are also important physiologic data regarding the continuous variable heart rate response to extraocular muscle manipulation. By separating all the numbers into to arbitrarily separated groups demarcated by the "magic" 20%.

Routine strabismus surgery requires 100-200 grams tension on rectus muscles. Deliberately gentle surgery may take 50 grams tension. (Machida Reference)

Thank you for your comments and reference. We added this statements with reference in background section.

Line 60-61, should include "Braun et al showed that sustained traction of 600 grams of the EOM induced a counter-regulatory effect…"

Thank you for your comment. We have revised the manuscript as you pointed out.

In Methods, you must describe what the surgeon felt was uniformity of amount and duration of tension, but that these were not actually quantified.

Thank you for your comment. So, we added the sentence in methods as follows: “The surgeon manipulated the extraocular muscle gently with uniformed tension in each of procedures.”
The duration of tension was measured variably according to each procedures. In this study, we hooked the muscle persistently until observing maximal recovery of decreased heart rate comparing with baseline heart rate. Thus, the duration of tension was variable at each surgeries. We added this point as limitations in discussion section. Thank you.

To get to an oblique muscle, often adjacent recti are tensioned first, so the actual tension on the oblique is usually not pure- instead a secondary impact following 1 or 2 adjacent recti. Did your surgeon feel that there was almost no other ocular manipulation before the inferior obliques, or were these associated with adjacent rectus tension by surgeon or assistant first?

Thank you for your comment. As reviewer pointed out, prior to surgery of inferior oblique muscle, muscle hook was placed behind lateral rectus to expose inferior oblique muscle. We speculated that these procedures could affect the tension of operated muscle.

The Tables are somewhat confusing: in Table 3, you report the occurrence of oculocardiac reflex with numbers and percentages in the column labeled "without OCR" you need to show why and OCR can be reported in the arbitrary group "without OCR."

Thank you for your comment. Simply, we tried to compare the results between the groups with OCR and without OCR according to the sequence of operated muscle. Obviously, we agree with your opinion. Thank you.

Table 5 would be particularly interesting if percentages given, and separated by atropine versus no atropine.
Thank you for your comment. IV atropine as premedication was applied to patients who were under 18 years old. In this study, most of cases were pediatric patients (91.9% of patients were under 18 years of age) Thus, we don’t have reliable statistical results to compare between two different groups. Thank you.

VERY IMPORTANT → Lines 96-101 describes that heart rates were recorded for each of these phases (every 5 seconds): 1) HR before EOM tension, 2) Maximum decreased HR after tension, 3) HR at maximum recovery that was close to baseline 4) HR with maintained traction (how long) defined as the adrenergic HR), and 5) HR at cutting of the muscle. It is OK to do all your comparisons with a 20% definition of OCR, but much more important to the physiology of the vagal response is the calculated percent changes from baseline for each of 2), 3), 4), and 5). Report as means, standard deviations, medians and ranges. Estimate how long from initial tension the recovery (3) and (4) took. Please separate data by those who got atropine and those who got no atropine. These this would be easily done in a table with 4 sets of values separated by two separate pharmacologic interventions. Give numbers of muscle tipes for each (ie. 37 LR, 5 MR, 10 IO). You seem to have generated part of this data as a result not mentioned until discussion line 204-205. This could be very related to Table 4.

Thank you for your comment. When the decreased HR 2) was observed initially, we monitored the HR persistently until confirmation of maximal HR recovery 3), 4). The duration of tension were not measured objectively. Thus, duration of tension was highly variable in this study. We revised and added this points as limitation in discuss section. IV atropine as premedication was applied the patients who were under 18 years old. In this study, most of cases were pediatric patients (91.9% of patients were under 18 years of age) Thus, we don’t have reliable statistical results to compare between two different groups. We have revised table 4 as reviewer pointed out (presented values of calculated percentages of heart rate with mean, SD, median and range). Thank you.
Lines 145 through 151 note that the defined OCR patients (greater than 20% drop) compared to the non-OCR (less than 20% drop) had greater heart rate changes with p-values. This may seem obvious but does not describe a physiologic difference other than that fitting an arbitrary definition of OCR at 20%.

Thank you for your comment. We agree with reviewer’s points. However, we’d like to demonstrate the characteristics of OCR during strabismus surgery through each procedures. We found, when the occurrence of the OCR was noted, relatively decreased HR in the OCR group were observed in every steps of surgery. Thank you.

Lines 132-134: you initially say recess 41%, resect 7% and oblique 3%, but then there was a "significant occurrence of resection surgeries)- is this significantly LESS as your percentages would indicate- your last sentence line 133-134 would seem to imply more with resection contradicting the preceding sentence.

Thank you for your comment. Among total number of resection surgeries (n = 15), the prevalence of resection surgery in patients with OCR (n = 12) was significantly higher than that in patients without OCR (n = 3). And we revised the manuscript as follows: “In the surgical techniques, resection surgeries were a significantly prevalent in patients with OCR than in patients without OCR (p = 0.03).” Thank you.

Line 142- do you mean bilateral LATERAL rectus muscle surgery?

Thank you for your comment. Yes, it means bilateral lateral rectus muscle surgery.
Line 153 and line 175- the resection being more- how do you conclude resection is more despite line 131-132 saying resection had 7% compared to recession having 41%?

Thank you for your comment. Among total number of resection surgeries (n = 15), the prevalence of resection surgery in patients with OCR (n = 12) was significantly higher than that in patients without OCR (n = 3). The percentage means the each surgical ratio of total surgeries. Recession surgeries consists of 41% and resection surgeries consists of 7% in total operated muscles.

Line 152- It is doubtful you have large enough sample size to power many conclusions about multivariate analysis (line 152-158) especially when there are actually two groups- those children with atropine and the adults without. Comment is discussion about power to conclude.

Thank you for your comment. In this study, most of cases were pediatric patients (91.9% of patients were under 18 years of age). Thus, we don’t have reliable statistical results to compare between two different groups. We consulted with a statistician about these data. However, there was no statistical significant result to demonstrate the other conclusion due to asymmetrical distribution of data. Thank you.

Some carefully describe a recovery of heart rate once all traction is released from the EOM (Machida reference).

Braun looked at ongoing tension. I believe your study is also describing heart rate with sustained EOM tension- perhaps over several minutes? This is important to separate from your Conclusion comment: line 220. As a treatment for profound OCR, many anesthesiologist comment to surgeon to "release tension." Resembling with more gentle tension after recovery- with non-tension is common however some patients persist with profound OCR (3-10 second asystole)
and are often treated with a bolus of IV anticholinergic sufficient to give baseline heart rate more tachycardia.

Thank you for comment. The heart rate after released muscle was also monitored in this study. We observed the maximal recovery of heart rate during hooked muscle. When we confirm the maximal recovery of heart rate, and we released muscle and other procedures (such as cutting and suturing the muscles) were performed. We demonstrated that decreased heart rate did not fully recover in patients with OCR. Thank you.

Thank you for mentioning the unmeasured tension at the very end of the Discussion. All the discussion from lines 175-193 could be explained by careful monitoring of extraocular tension- or there could be other factors which your study uniquely address, such as the sutting of the EOM tendon which you say caused a mean 10% drop (line 204-205)

Thank you for your comment.

The Machida reference is missing.


Thank you for your comment. We added this article as references in our manuscript. Thank you.