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The Stress of Cataract Surgery

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Abstract

Background: To assess the stress levels of three different grades of surgeons during cataract surgery.

Design: Observational study.

Participants: Three healthy male ophthalmic surgeons (Surgeon A, a specialty trainee, Surgeon B, a cataract surgery fellow, and Surgeon C, a consultant) were studied during 95 consecutive uncomplicated local anaesthetic phacoemulsification cataract extraction procedures.

Methods: A pulse oximeter was used to record the heart rates of the 3 surgeons while they operated. The readings were taken at baseline and at every 2 seconds during the operation. The percentage change from baseline for each stage was compared for individual surgeons and amongst the three surgeons using one-way ANOVA test.

Results: Observations were recorded on 29 cases for Surgeon A and 33 cases each for Surgeon B and Surgeon C. Overall there was a significant increase for capsulorhexis ($p=0.007$), phacoemulsification ($p<0.001$) and lens implantation ($p=0.002$) and wound closure ($p=0.149$). Surgeon A showed highest elevation during phacoemulsification ($p<0.001$). Surgeon B did not demonstrate a higher increase at a particular stage ($p=0.103$); and Surgeon C had a higher heart rate towards the completion of the procedure ($p<0.001$).

Conclusions: Published reports have highlighted the stress surgeons in different specialties undergo. Ours is the first study to demonstrate a change of heart rate from the baseline and hence stress between cataract surgeons of different grades. This change may be attributed to the difference between their experience and skills. Further studies can be undertaken to better identify stages of greater stress and means to reduce it.

Keywords: Phacoemuslification; Surgeon stress; Heart rate

Introduction

Phacoemulsification is the most common elective surgical procedure performed under the National Health Service in the United Kingdom [1]. Most emphasis during the procedure is paid to preserving the integrity of the posterior capsule. The integrity of this thin membrane, barely 10 micrometres [2], is what stands in most cases between a successful surgical outcome and a complicated operation.

Surgery is generally a stressful undertaking for both the operator and the patient [3]. Trainee ophthalmologists often find themselves under stress trying to avoid complications of cataract surgery and at the same time improving their speed and efficiency. Different grades of surgical experience (trainee, fellow and consultant) may experience the stress to different degrees.

In this study we wanted to assess the stress levels of different grades of ophthalmic surgeons during different stages of cataract surgery.

Methods

This was a prospective observational study. We recruited three male surgeons; Surgeon A: a trainee, aged 31years, with an unscrubbed supervisor in presence; Surgeon B: a cataract surgery fellow aged 34 years and Surgeon C: a consultant aged 47years. None of the subjects had any known cardiac history. No psychiatric illness or medication use was identified. All the procedures were performed under local anaesthetic in a day-surgery unit. All surgeons shared a list of 7 cases in a session.

For each case, a pulse oximeter (Radical 7, Massimo, Irvine, CA) was attached to the surgeon's right ear lobe. The baseline heart rate was recorded. The heart rate was then measured every 2 seconds inaudibly during the entire cataract operation. The start and finish time of the steps of the procedure (incision, capsulorhexis, hydrodissection, phacoemulsification, irrigation & aspiration, intraocular lens insertion and wound closure) was recorded by a non-surgical observer who was masked to the actual heart rate readings. For each step the mean heart rate was calculated. The difference in heart rate for each step from the baseline was taken as a measure of the surgeon's stress during that step.

Difference in heart rate from the baseline for each step was then compared between the three surgeons using one-way ANOVA. Ethics approval was not required for this study.

Results

The 3 subjects were studied for 95 consecutive cases, 29 for Surgeon A and 33 each for Surgeon B and C. The time taken to complete each stage by the individual surgeons is presented in Table 1.

Comparing the different stages for all three surgeons, there was a statistically significant difference in the changes of heart rate of the surgeons for capsulorhexis ($p=0.007$), phacoemulsification ($p<0.001$) and lens implantation ($p=0.002$) (Table 2).

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	Surgeon A		Surgeon B		Surgeon C	
	Mean (Range)	Standard deviation	Mean (Range)	Standard deviation	Mean (Range)	Standard deviation
Incision	100 (65-124)	9.8	65 (55-72)	2.8	53 (45-60)	2.5
Capsulorhexis	158 (150-165)	2.5	93 (82-105)	3.8	65 (60-72)	2.0
Hydrodissection	56 (44-65)	3.5	45 (40-59)	3.2	33 (30-41)	1.8
Phacoemulsification	616 (602-820)	36.3	453 (444-472)	28.0	353 (333-476)	23.8
Irrigation Aspiration	131 (100-188)	14.7	120 (115-145)	5.0	99 (72-133)	10.2
Lens insertion	70 (45-125)	13.3	45 (35-55)	3.3	50 (35-90)	9.2
Wound Closure	20 (12-45)	5.5	13 (10-18)	1.3	10 (9-35)	4.3

Table 1: The duration (in seconds) at identified stages of the operation for each surgeon.

	Incision *(p=0.455)*	**Capsulorhexis** *(p=0.007)*	**Hydrodissection** *(p=0.031)*	**Phacoemulsification** *(p<0.001)*	**Irrigation Aspiration** *(p=0.018)*	**Lens insertion** *(p=0.002)*	**Wound closure** *(p=0.149)*
Surgeon A *(p<0.001)*	-1.2% (6.09)	+3.7% (8.35)	+5.7% (9.06)	+12.7% (10.77)	+7.1% (8.82)	+6.0% (9.37)	+6.2% (9.6)
Surgeon B *(p=0.103)*	0.0% (5.3)	+1.6% (7.29)	+2.4% (7.7)	+5.0% (7.95)	+4.4% (8.81)	+2.1% (6.07)	+2.4% (7.16)
Surgeon C *(p<0.001)*	-1.5% (3.75)	-1.7% (3.76)	+0.8% (4.53)	+3.2% (4.55)	+1.0% (7.2)	-0.3% (4.44)	+4.4% (5.8)

Table 2: Mean (with standard deviation) percentage change from baseline in heart rate for identified stages of the operation.

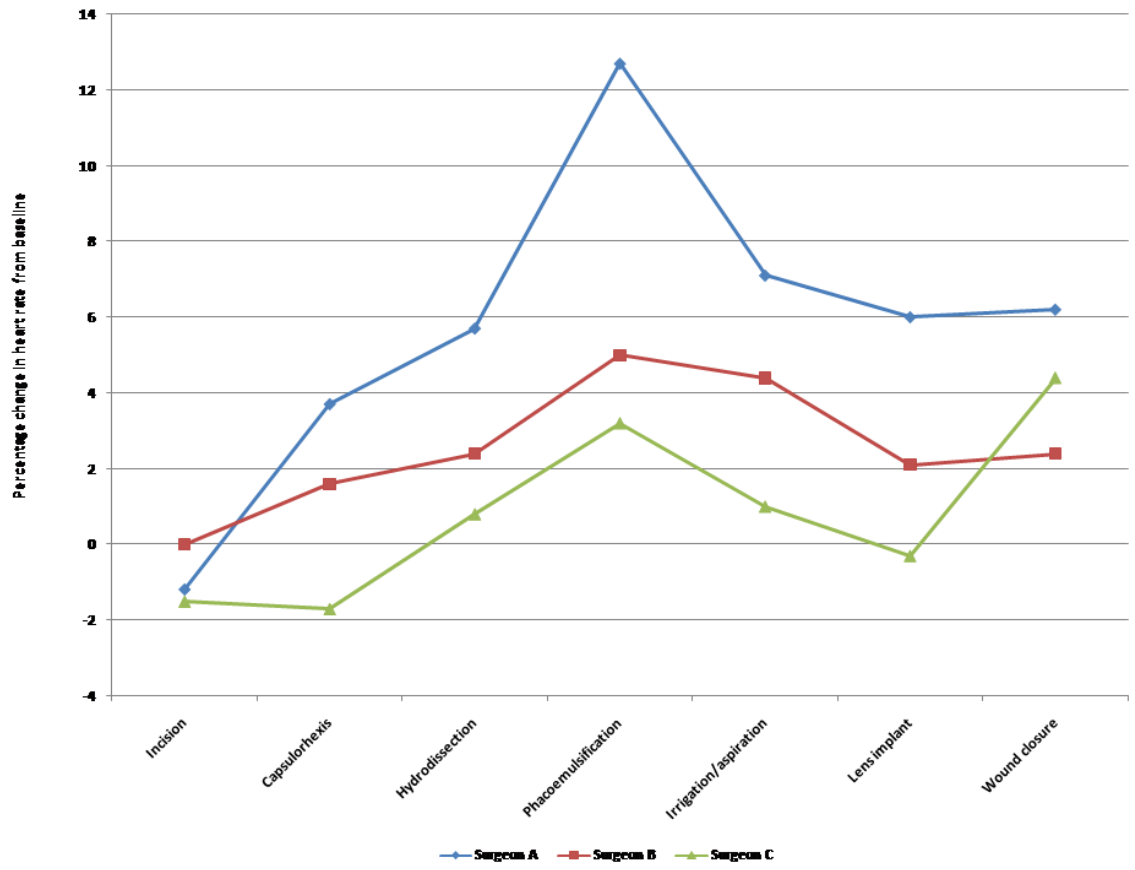

Figure 1: Variation in heart rate from baseline for each surgeon during identified stages of the operation.

The percentage change in heart rate was different for each surgeon during different stages of the procedure (Figure 1): Surgeon A had the most increase at the phacoemulsification stage ($p<0.001$); Surgeon B did not have an identifiable stage where his heart rate increased significantly more than other stages ($p=0.103$); whereas Surgeon C showed a significant increase in heart rate at the closing stages of the procedure ($p<0.001$).

Discussion

We have not come across any reports of the stress experienced by the surgeon during cataract surgery. Trainee surgeons have been reported to be under more stress when operating independently in general surgery [4] – our study finds the same for cataract surgery.

Our subjects showed decreased excitability of heart rate with increased experience of the surgeon. Surgeon A, the specialist trainee was most stressed during phacoemulsification of the lens, possibly because of the greater risk of posterior capsule damage and vitreous loss during this stage. This was the longest stage of the operation for all three surgeons and Surgeon A took a mean of 3-4 minutes longer than the other 2 subjects longer to complete this stage. This would mean a longer period of higher stress for the trainee when breaking and extracting the lens. Surgeon B, the cataract surgery fellow who would perform the same procedure multiple times every day of his working week, showed a more uniform rise in heart rate across the different stages. Interestingly the heart rate for Surgeon C showed a higher increase at wound closure, which was the shortest duration stage. This is unlikely to be the stress of surgery and more likely to be due to influence of external factors such as co-ordinating the arrival of the next patient.

An increase in heart rate is an indicator of stress [4-6]. Being under stress can affect manual performance, and therefore the outcome of the procedure [7]. Stress is also a recognised risk factor for cardiovascular disease [8]. Whether this constitutes an occupational hazard for surgeons including ophthalmologists is a matter open to debate but the high increase is percentage heart rate during certain parts of a cataract procedure is a source of concern for all ophthalmologists.

Although ours is the first report that looks at stress during cataract surgery, we are aware that it was only a snapshot study of a very small number of subjects. A study involving a larger number of subjects as well as an increased number of routine and complex surgeries performed by them would be able to provide a more conclusive argument. Other parameters (for instance sweating and changes in blood oxygen levels, blood pressure and electrocardiogram) that can potentially indicate mental stress could also be of significance [4]. These could not be included in our study as measuring them would physically interfere with the operation. We could have also employed self-report questionnaires [9] but that would have impacted on the surgical session's duration, possibly adding to the stress. Another study could look at whether there is any difference in the stress response between the genders. It would also be interesting to monitor the stress response of a supervisor when a trainee is operating.

If the results from a larger study match our findings perhaps measures to reduce stress for cataract surgeons can be identified. These could then be directed towards younger trainees in particular, looking at other factors such as the presence or absence of a supervisor, clearer instructions during the procedure and improved pre-procedure planning.

Financial Interest

None of the authors have any financial conflict of interest to declare from this report.

Competing/Conflicts of Interest

None.

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