

## Short Reports

### Are surgeons spunkier than non-surgeons?

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#### ABSTRACT

**Background.** Surgeons are known to be bolder than other members of the medical profession. Testosterone levels are known to be higher in aggressive men. We wondered whether the above two statements indicated that the spunkiness of surgeons was related to higher testosterone levels.

**Methods.** Sixteen surgeons and 16 non-surgeons, all men, aged 32–59 years took part in a prospective study that assessed their testosterone levels.

**Results.** There was no statistical difference between the testosterone levels of the two groups.

**Conclusion.** The reason for the gutsy behaviour of surgeons is not linked to their testosterone levels. Surgeons were disappointed to know this while non-surgeons were amused and a bit relieved.

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#### INTRODUCTION

It is generally accepted that by the very nature of their work, surgeons are braver than other members of the medical profession as they have to cut out organs, deal with bleeds, operate in emergency situations, etc. One of us (SAP) has earlier suggested that the collective term for surgeons is 'pride of surgeons' because they are a cocky and confident lot.<sup>1</sup> How do they manage this? We hypothesized that the testosterone levels of surgeons are higher than those of non-surgeons. This hypothesis is not entirely without basis; there is enough and convincing evidence that higher testosterone levels are associated with dominance and aggression, across humans and other species.<sup>2–5</sup>

To test our hypothesis, we compared testosterone levels in surgeons with those in non-surgeons.

#### METHODS

##### Study subjects

The study population included doctors in active practice at a single centre. The study was cleared by the hospital institutional review board and signed informed consent was obtained from all volunteers. Blood samples (5 ml each) were collected from volunteers in serum separator tubes, between 8 a.m. and 11 a.m. to compensate for diurnal variation.<sup>6</sup> Blood was allowed to clot for 30 minutes and then centrifuged. Serum was used for estimation of the different parameters. The doctors were divided into two groups: surgeons and non-surgeons.

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#### Biochemical measurements

All assays were done using established commercial assays. Total testosterone was measured quantitatively using a competitive binding chemiluminescent immunoassay (Beckman Coulter Access 2 analyser, Brea, CA, USA). The analysis was done within 3 hours of sample collection. The assay had a calibration range of 10–1640 ng/dl (0.347–57.151 nmol/L) and coefficient of variation (CV) of up to 10%.

Sex hormone-binding globulin (SHBG) was measured quantitatively using a two-step sandwich chemiluminescent immunoassay (Beckman Coulter Access 2 analyser, Brea, CA, USA). The analysis was done within 8 hours of sample collection at another laboratory because of non-availability of the assay kit in our laboratory on the days of the investigation. The calibration range of the assay was 0.2–200 nmol/L, and CV was up to 7% at concentrations >2.0 nmol/L.

Albumin was measured quantitatively by means of a bichromatic digital end-point methodology using bromocresol purple reagent (Beckman Coulter DXC 800 analyser). The analytical range of the assay was 1–7 g/dl (10–70 g/L). The CV of the assay was up to 3%.

Calculation of free and bioavailable testosterone was done using values of total serum testosterone, SHBG and serum albumin, and an online calculator available on the website of the International Society for the Study of the Aging Male ([www.issam.ch/free\\_testo.htm](http://www.issam.ch/free_testo.htm)).<sup>7</sup>

#### Statistical analysis

Inter-group comparisons were done using Student *t*-test and the Statistical Package for Social Sciences, version 15 for Windows.

#### RESULTS

Two of the 34 people (one from each group) declined our request to participate in the study. The rest were willing participants (two people who were most enthusiastic to participate were surgeons) and included 16 surgeons and 16 non-surgeons. All the participants were men and their ages ranged from 32 to 59 years. The two groups were similar in age (43.3 [8.2] years v. 42.2 [8.0] years). The surgeons included general/gastrointestinal surgeons (*n*=5), cardiac surgeons (*n*=3), neurosurgeons (*n*=2) and one each of an orthopaedic surgeon, surgical oncologist, transplant surgeon, urologist, ENT surgeon and vascular surgeon.

Non-surgeons included physicians working in a variety of fields including cardiology, gastroenterology, paediatrics and anaesthesiology (*n*=2 each) and one each of infectious disease, pathology, radiology, intensive care, haematology, medical oncology, rheumatology and neurology.

The levels of serum total testosterone, free testosterone and bioavailable testosterone were similar in the two groups (Table I).

TABLE I. Mean (SD) serum testosterone levels in surgeons and non-surgeons

Testosterone	Surgeons ( <i>n</i> =16)	Non-surgeons ( <i>n</i> =16)	p value
Total (ng/dl*)	300.9 (77.2)	297.1 (103.9)	0.91
Free (pg/ml†)	0.687 (0.154)	0.685 (0.212)	0.98
Bioavailable (ng/dl*)	160.9 (37.7)	162.4 (55.4)	0.93

\* conversion factor for total and bioavailable testosterone from ng/dl to nmol/L is 0.0347 † conversion factor for free testosterone from pg/ml to pmol/L is 3.47

## DISCUSSION

We hypothesized that surgeons were spunkier or gutsier than other members of the medical profession and tended to take greater risks because of higher testosterone levels. Raised testosterone levels are associated with increased aggressiveness and bravado.<sup>5</sup> It is generally believed, albeit as a result of only two studies, that the bull shark (*Carcharhinus leucas*), one of the most ferocious of animals, has the highest testosterone levels in the animal kingdom.<sup>8,9</sup> A surgeon, goes an old saying, must have an 'eagle's eye, a lion's heart and a lady's hand'. If our thesis had been proved, the phrase 'the testicles of a bull shark' would have been an appropriate addition.

We are disappointed that we could not prove our hypothesis. It had not escaped our notice (to borrow Watson and Crick's famous phrase),<sup>10</sup> that had our postulate been correct, the selection mechanism for future trainee surgeons could rely on serum testosterone measurements, as a 'sorting hat' (the term used in the Harry Potter novels) rather than rely on cumbersome interviews and entrance examinations. Equally disappointed are the surgeons among our volunteers, who wished to demonstrate biochemical evidence of their machoism.

Is it possible that there is in fact a difference between surgeons and non-surgeons that our study failed to detect? If so, what are the possible reasons for similar levels of serum testosterone in the two groups? One possibility is referral bias, well known to those evaluating epidemiological data. Such a bias exists at all levels. Thus, perhaps physicians in tertiary care hospitals, our control group, are spunkier than their counterparts in the community. Or perhaps there were more alpha males in the non-surgeon group than in the surgeon group. Alternatively, could it be that our findings were biased by the fact that the non-surgeon group included intensivists, interventional cardiologists and an aggressive pathologist, who might have skewed the data? The highest testosterone levels were in a young non-surgeon; perhaps this too added to the unexpected results. Yet another possibility is that while the economic theory study on testosterone levels was done on a general population, our study has been done on a preselected group; all medical doctors, a group not particularly lacking in confidence and modesty.<sup>2</sup> Alternatively, perhaps our findings are true only for Indian doctors and should not be extrapolated for surgeons and physicians the world over. Finally, of course, it is possible that some other factor is responsible for surgical confidence. The monoamine oxidase A (*MAOA*) gene is associated with attitude towards risk taking and so is the dopamine receptor *D4* gene as well as 5-HTTLPR.<sup>11,12</sup> Our laboratory is currently incapable of doing these investigations and we look forward to collaborating with other researchers.

In this evidence-based world, our findings will only gain people's confidence once someone is able to replicate the results. There have been, in the past, papers on a similar topic but with contradictory results and conclusions, e.g. 'Are orthopaedic surgeons gorillas?' and 'Are orthopaedic surgeons really gorillas?'<sup>13,14</sup> Along these lines, we hope to see a paper in the near future, perhaps from a pride of thinking surgeons. To make it easier for our surgical brethren, we even suggest a title for this potential paper: 'Are physicians really as spunky as surgeons?' Until then, our hypothesis would fit into what T.H. Huxley called 'the great tragedy of science: the slaying of a beautiful hypothesis by an ugly fact'.<sup>15</sup>

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*Conflict of interest.* The testosterone kit was supplied by Beckman Coulter and fees for SHBG levels were paid by them. There are no financial relationships with any organizations.

## REFERENCES

- 1 Pai S. Collective terms for doctors. *BMJ* 2002;**325**:1498.
- 2 Burnham TC. High-testosterone men reject low ultimatum game offers. *Proc Biol Sci* 2007;**274**:2327–30.
- 3 Mazur A, Booth A. Testosterone and dominance in men. *Behav Brain Sci* 1998;**21**:353–63.
- 4 Robbins MM, Czekala NM. A preliminary investigation of urinary testosterone and cortisol levels in wild male mountain gorillas. *Am J Primatol* 1997;**43**:51–64.
- 5 Sullivan A. The He hormone. *The New York Times Magazine* April 2000.
- 6 Crawford ED, Barqawi AB, O'Donnell C, Morgentaler A. The association of time of day and serum testosterone concentration in a large screening population. *BJU Int* 2007;**100**:509–13.
- 7 Free and bioavailable testosterone calculator. Available at [www.issam.ch/freetesto.htm](http://www.issam.ch/freetesto.htm) (accessed on 12 Sep 2012).
- 8 Harold LP Jr, Samuel HG, Taniuchi T. Elasmobranchs as living resources: Advances in the biology, ecology, systematics, and the status of the fisheries. *NOAA Technical Report NMFS* 1990;**90**:143–55.
- 9 Rasmussen LEL, Murru FL. Long-term studies of serum concentrations of reproductively related steroid hormones in individual captive carcharhinids. *Aust J Mar Freshwater Res* 1992;**43**:273–81.
- 10 Watson JD, Crick FHC. A structure for deoxyribose nucleic acid. *Nature* 1953;**171**:737–8.
- 11 Zhong S, Israel S, Xue H, Ebstein RP, Chew SH. Monoamine oxidase A gene (*MAOA*) associated with attitude towards longshot risks. *PLoS One* 2009;**4**:e8516.
- 12 Kuhnen CM, Chiao JY. Genetic determinants of financial risk taking. *PLoS One* 2009;**4**:e4362.
- 13 Barrett DS. Are orthopaedic surgeons gorillas? *BMJ* 1988;**297**:1638–9.
- 14 Fox JS, Bell GR, Sweeney PJ. Are orthopaedic surgeons really gorillas? *BMJ* 1990;**301**:1425–6.
- 15 Shapiro F. *The Yale book of quotations*. New Haven: Yale University Press; 2012:379.