

Differences in Final Product of a Bowel Anastomosis of Male and Female Novice Surgeons

Dhalia Masud, MRCS, BSC, MBBS, Shabnam Undre, PhD, MRCS, MBBS, and Ara Darzi, KBE, PC MD, FMedSci, HonFREng, FRCS, FRCSEd, FRCPSG, FACS, FCGI, FRCPE, FRCP, HonFRCPI

Imperial College Academic Surgical unit, St. Marys' Hospital, Paddington, United Kingdom

INTRODUCTION: There is a disproportionate ratio of male to female surgeons when compared with the ratio at medical school. Although gender differences in surgical technical ability is not known, studies have shown gender differences in visuospatial ability and manual dexterity. We devised a study to assess objectively the quality of final product of small bowel anastomosis in male and female novice surgeons to explore differences in surgical technical ability.

METHODS: Thirty-six novice surgeons in the final year of medical school with minimal surgical experience were taught surgical knot tying and small bowel suturing. The students were asked to complete 7 small bowel anastomosis in 7 separate sessions. The quality of the final product was assessed looking at the "fine details" (number of sutures and accuracy, ie, ratio of sutures piercing the full thickness of the bowel) and the "gross apposition" of the bowel ends at the anastomotic site. A grading system for apposition was devised to assess apposition.

RESULTS: The results with fine details and accuracy of suturing revealed that female surgeons were significantly better in the fourth to the sixth sessions with no gender difference in the number of sutures placed. With gross apposition at the anastomotic ends, male surgeons were consistently better between the third to the sixth session. However, these differences were eliminated with training.

CONCLUSIONS: Known gender differences in visuospatial ability and manual dexterity may explain the initial gender differences in the quality of the final product. However, these differences were not present by the end of the training sessions. Therefore, with training, no difference in surgical technical ability was found between male and female novice surgeons. (J Surg 68:185-189. © 2011 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

Correspondence: Inquiries to Dhalia Masud, MRCS, Imperial College Academic Surgical unit, St. Marys' Hospital, Paddington, United Kingdom; fax: 0203 3126950; e-mail: dhalia.masud@doctors.org.uk

COMPETENCY: Medical Knowledge, Practice Based Learning and Improvement, Systems Based Practice

INTRODUCTION

Approximately half of medical student intakes are women; however, this is not represented in the surgical specialties given that four fifths of all surgeons are men.¹ The reasons for this are likely to be multifactorial, including media influences,² family life choices,³ and student gender differences in opportunities and encouragement by surgeons.¹ Nonetheless, both men and women select similar reason for going into surgery.³⁻⁶

Little is known regarding gender differences in surgical technical ability; however, studies do show differences in psychomotor abilities.⁷⁻¹⁴ These studies show mainly that men have an advantage in visuospatial ability and women have an advantage in manual dexterity. However, Berfield et al.¹⁴ found that visuospatial ability was related negatively to the masculine gender role, and influencing factors are beyond the biological sex.

Because the introduction of the European working time directives and modernizing of medical careers, there is also a greater emphasis on the use of psychomotor ability tests in the preselection of surgical trainees.¹⁵⁻¹⁸ Research shows a variable relationship between manual dexterity and surgical skill. Datta et al.¹⁹ found a strong correlation and Steele and Walder²⁰ found a negative correlation. More data show a positive correlation of visuospatial ability and surgical ability.^{15,21,22} With known gender differences in psychomotor ability and correlations with surgical technical ability, we considered whether there were gender differences in surgical technical ability and asked "Can there be a research basis on preselecting a particular gender for surgery?"

By assessing objectively the quality of final products of male and female novice surgeons, we aim to determine whether differences exist in surgical technical ability and also whether the disproportionate gender ratio of surgeons can be explained by the results.

TABLE 1. Assessment of Fine Details of Bowel Anastomosis

Fine Detail	
Number of sutures	Number of sutures per small bowel anastomosis (β)
Accuracy of sutures	α/β —Ratio of number of sutures that traversed full thickness α —Number of full-thickness sutures β —Number of sutures per anastomosis

METHOD

Thirty-six novice surgeons all senior medical students (18 men and 18 women) were recruited from a single United Kingdom medical school, all with an interest in a career in surgery. Students were recruited after an e-mail advertisement to final year medical students.

The level of prior surgical exposure of all subjects was as scrubbed observers and all had minimum suturing abilities. All students were planning to train in surgery, but none had decided on a subspecialty. None had completed small bowel suturing or could hand tie surgical knots. Subjects, gender, level of theater exposure, and details on the quality of final product were recorded anonymously so subjects could not be identified, directly or through identifiers linked to the subjects.

Students were taught hand-tied surgical knots by a surgical registrar in the first session. In the second session, students were taught how to hold surgical instruments and received a demonstration on small bowel suturing by the same surgical registrar

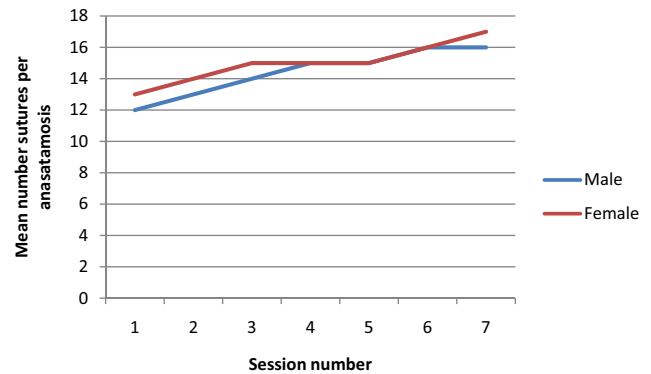


FIGURE 1. The difference between male and female surgeons placing sutures per small bowel anastomosis. Both genders placed increasing number of sutures in the same diameter bowel with progressing sessions (Pearson correlation: female surgeons, $r = 0.971$, male surgeons, $r = 0.975$, $p < 0.05$). Using the t test, there are no significant differences between male and female surgeons with each session.

using instructions from the basic surgical skills guide. They were then allowed to place practice sutures in this session.

Each subject repeated a bench model small bowel suturing 7 times in 7 separate sessions. The sessions were completed at weekly intervals and were all supervised.

Small bowel suturing was chosen because it requires a 3-dimensional manipulation for apposition of the bowel ends as well as the fine technique to maintain sutures within the layers of the bowel. This, therefore, gives better evaluation rather than suturing straight on a flat surface. The quality of the final product was assessed. The number of sutures placed and the accu-

TABLE 2. Assessment of Gross Detail of Bowel Anastomosis

Grade		
Grade 1:	Fully apposed	
Grade 2:	Cross section of bowel visible in 1 area at the anastomotic site	
Grade 3:	Cross section of bowel visible in >1 area at the anastomotic site	
Grade 4:	Cross section of bowel with surface mucosa visible in 1 area at the anastomotic site	
Grade 5:	Cross section of bowel with surface mucosa visible >1 area at the anastomotic site	

Three registrars completed small bowel anastomosis, and all achieved grade 1 anastomosis.

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