

Chapter 2

Microsurgery Training: What Should a Resident Know? Should All Microsurgeons be Fellowship Trained?

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Abstract Surgery for male infertility has evolved into a highly specialized endeavor within the specialty of Urology. Most procedures in this field, including vasectomy reversal, varicocele ligation, and sperm retrieval are performed with microsurgery. In some Urology residency programs, training in male infertility may not be viewed as a priority and many Urology departments do not have a faculty member dedicated to this field. As a result, there is a perception among male infertility specialists that many urologists' training is deficient in this area. This chapter outlines the need and scope of microsurgical training in residency and reviews the impact of fellowship training on the practice of urologic microsurgery.

Keywords Microsurgery • Training • Fellowship • Education • Residency

Surgery for male infertility has evolved into a highly specialized endeavor within the specialty of Urology. Most procedures in this field, including vasectomy reversal, varicocele ligation, and sperm retrieval are performed with microsurgery. In some Urology residency programs, training in male infertility may not be viewed as a priority and many Urology departments do not have a faculty member dedicated to this field. As a result, there is a perception among male infertility specialists that many urologists' training is deficient in this area.

Along with this perceived deficiency in male infertility training is a concern regarding a deficiency in microsurgery training. In US residency training programs,

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it is not possible to gather data on the number of microsurgical cases performed by a particular resident. Infertility microsurgery procedures are included in the category of "scrotal surgery" which would also include hydrocelectomy and spermatocelectomy, among others. This concern has implications for which practitioners should be allowed to perform microsurgical procedures such as vasectomy reversals. Vasovasostomy (VV) can be performed without an operating microscope but it is generally acknowledged that outcomes for vasectomy reversal are superior with microsurgery [1]. Despite this generally accepted information, considerable variability in practice patterns exists. In a study of practicing urologists who perform vasectomy reversals, 56% of community urologists, 65% of academic, non-fellowship-trained urologists, and 93% of fellowship-trained urologists used an operating microscope [2]. In some cases, vasoepididymostomy (VE) is required for vasectomy reversal [3]. Given the dimensions of the epididymis, it would be impossible to perform VE without an operating microscope. It seems unlikely and few would disagree that one could receive sufficient microsurgery training in residency to adequately perform VE. Thus, most male infertility specialists would say fellowship training is required to perform VE.

Some investigators, with justifiable concern, have suggested that vasectomy reversals should be performed only by those able to perform VE. In their study, Chawla et al. reported that 48% of failed anastomoses were due to untreated epididymal obstruction where a vasovasostomy rather than vasoepididymostomy was performed. The possibility of selection bias exists, as these patients were all seen at a tertiary center for redo reversals after an initial failed reversal elsewhere [4]. Nonetheless, other studies clearly describe a significant chance for failed reversals secondary to epididymal obstruction if only VV is performed.

The probability of epididymal obstruction and the need for VE increases with increasing time since the vasectomy. For example, in the study by the Vasovasostomy Study Group, the patency rate for VV was 70% for obstructive intervals of at least 15 years [5]. This suggests that the prevalence of bilateral epididymal obstruction is 30% (assuming 100% patency) for this obstructive interval. Similarly, Fuchs and Burt demonstrated that with an obstructive interval of 15 years, over 60% of men required a VE on at least one side [6].

Predicting with certainty when VE is required is not possible but the probability of requiring VE can be estimated based on the discussion above. One must determine what failure rate would be tolerated if VV were performed for everyone, regardless of need for VE, and determine a maximum obstructive interval that corresponds to this failure rate. For example, if one accepts a possible 30% technical failure rate, then only surgeons who can perform VE should perform reversals for obstructive intervals greater than 15 years. The alternative is to allow only those capable of performing VE (likely only those with fellowship training) to perform vasectomy reversals.

A recent study by Nangia et al. examined the distribution of male infertility specialists in the USA. Data were obtained from the membership directories of two subspecialty societies devoted to the study and treatment of male infertility, The Society for the Study of Male Reproduction (SSMR) and the Society for Male Reproduction and Urology (SMRU). Their study suggested that large areas of the

country are underserved with respect to care for male infertility. For example, 13 states had no male reproductive specialists [7]. These data would therefore suggest that there simply are not enough fellowship-trained urologists to provide all the male infertility care, so general urologists, by necessity, should be able to perform the basic evaluation and procedures in this subspecialty.

What should be considered basic evaluation and procedures? It is the authors' opinion that the general urologist should be able to perform the initial history, physical and laboratory evaluation. With respect to procedures for male infertility, the general urologist could perform diagnostic testis biopsy, varicocele ligation and possibly VV. Given our capability to distinguish between obstructive and nonobstructive azoospermia in most instances based on history, physical examination and serum FSH level, a testis biopsy is rarely required for diagnostic purposes only. As described above, VV outcomes are generally superior with microsurgery. In addition, there is literature that suggests microsurgical varicocele ligation has superior results and fewer complications than non-microsurgical techniques. Therefore, residency training programs should provide education that allows the graduating resident to be able to perform the basic evaluation and basic procedures. In our residency, we have offered a 1 week laboratory course as an introduction to microsurgery. Residents also rotate through the outpatient clinic and participate in the evaluation of male infertility patients.

Even if one takes the position that only fellowship-trained urologists should do microsurgery, residency training should still at least expose the resident to male infertility and microsurgery. Without this exposure during residency, it seems unlikely that one would be stimulated to pursue additional fellowship training in the field.

More specialized procedures, such as microsurgical sperm retrieval, require more specialized training and collaboration with reproductive endocrinologists that perform in vitro fertilization [8]. Thus, it seems unlikely that the general urologist who did not complete fellowship training would have the required training to perform these procedures. Therefore, microsurgical sperm retrieval is probably best performed by those urologists with fellowship training in male infertility and microsurgery. Based on the above discussion, then, microsurgical training is important for providing optimal care for male patients with infertility and general urologists should be able to provide at least basic care. It follows then that basic male infertility and microsurgical training should be included in residency training. Training programs that do not have a specialist dedicated to this field would hopefully recognize this need and recruit a faculty member with expertise in male infertility and microsurgery.

Should all Urologic Microsurgeons be Fellowship Trained?

While fundamentally a philosophical question, it is worth exploring the impact of specialized fellowship training on our profession as urologic microsurgeons.

Over the few past decades, surgery has undergone significant evolution fueled by a forever-expanding quest for knowledge and incorporation of innovative

surgical technologies [9–11]. In the face of such rapid evolution, issues concerning education and training have become paramount. Longer and more advanced training programs with increased specialization for urological surgeons have emerged as coping strategies in both education and practice. Throughout the urological community in Canada and the USA, increasing emphasis is being placed on surgical fellowships that provide periods of highly specialized and advanced surgical training, following the completion of formal residency training [9, 12–14]. Moreover, there continues to be a trend towards “credential inflation” to the point where new faculty positions within academic surgical programs almost universally require specialized fellowship training and a commitment towards research or teaching. Increasingly, many community and private practice positions are seeking urologists with unique and specialized skills sets and fellowship experience.

For the trainee, fellowships offer a period of focused training with high-volume surgical exposure allowing for the development of specialized technical skill sets and sound intraoperative judgment. They allow trainees to develop algorithms for the delivery of evidence based clinical care and cultivate the seeds towards a future program of research and scholarship. Fellowships stimulate networking among specialists with common interests and often lead to strong mentoring relationships with more established surgical faculty [9].

For the fellowship training programs and faculty, fellows contribute to the academic and financial productivity of the department, provide a high level of clinical service to patients, teach residents and medical students, share in the on-call duties, and represent a vehicle for national and international dissemination of program expertise and reputation [9].

Urologic microsurgery has evolved to become a highly specialized discipline that typically falls within the domain of the male infertility specialist. The surgical repertoire includes procedures like microsurgical vasectomy reversal (including both vasovasostomy and vasoepididymostomy), microsurgical varicocelectomy, microsurgical testicular sperm extraction (micro-TESE), and microsurgical spermatic cord denervation for chronic orchialgia. While many of these surgeries can and have been performed without microsurgical magnification, best evidence to date suggests that a microsurgical approach significantly enhances technical precision and leads to better patient outcomes [8, 15–17].

Better patient outcomes are also achieved with increased surgical volume and experience [18, 19]. However, exposure to microsurgery during urology residency is limited in many programs. Not all training programs have faculty dedicated to the practice of male infertility and microsurgery. Consequently there is a deficiency in both practical knowledge and skill among graduating urologists that can adversely impact patient care and surgical outcomes.

Urologic microsurgery is particularly challenging due to the inherent size and unique characteristics of the male reproductive anatomy. The microsurgical vasoepididymostomy (VE) best exemplifies this concern. In an analysis of patients undergoing a redo vasectomy reversal, Chawla et al. [20] demonstrated that 48% of vasectomy reversal failures were due to unrecognized epididymal obstruction. This finding likely reflects the inability of the original surgeon to perform a VE or a deficiency in their

knowledge that a VE was indicated. The authors of this study concluded that all surgeons offering vasectomy reversal should be able to offer VE if indicated in order to best serve patients and their future fertility. Few urology residency graduates would be equipped to perform a VE without fellowship training in microsurgery.

Specific to vasectomy reversal, Crain et al. [21] highlighted important differences in practice patterns between fellowship-trained and non-fellowship-trained urologists. In particular, fellowship-trained infertility specialists performed significantly more vasectomy reversals and were more likely to perform procedures for patients with an obstructive interval >15 years. Moreover, surgeons with fellowship training were more likely to use an operating microscope, examine the vasa fluid intraoperatively and use finer suture material compared to surgeons without fellowship experience.

Currently there are ten established fellowship training programs devoted exclusively to the practice of male infertility and microsurgery within North America [22]. Training periods range from 1 to 2 years. Some offer a dedicated basic science research experience. All are supervised by specialists with extensive microsurgery experience. All fellowships offer high-volume clinical and surgical patient exposures that are complimented by the opportunity for repetitive, deliberate practice in the microsurgical skills laboratory.

The importance of good microsurgical fellowship training prior to independent surgical practice was recently reviewed by Williams et al. [23] who reported on the microsurgical vasectomy reversal outcomes of ten recently graduated (within 2 years) fellowship-trained microsurgeons. Analyzing a total of 310 microsurgical vasectomy reversals, overall patency rates (91%) and postoperative semen parameters were consistent with those reported by experienced microsurgeons. Unfortunately, there is no comparable data available on the operative outcomes of non-fellowship-trained specialists as it relates to urologic microsurgery.

Some insight on the impact of fellowships on the “surgical learning curve” is offered by Bianco et al. [24] who investigated the effects of fellowship training on cancer control following open radical prostatectomy. Overall, fellowship-trained surgeons had significantly lower rates of biochemical recurrence and positive surgical margins as compared to non-fellowship-trained surgeons. Interestingly, such findings were mitigated as the surgical experience of the non-fellowship-trained surgeons increased. The authors concluded that the surgical volumes that come as part of fellowship training could modify the slope of the surgical learning curve.

The duration of fellowship training that is required to achieve a sufficient degree of microsurgical competence is debatable and depends largely on the motivation and talents of the individual trainee together with the structure, objectives and opportunities provided within the fellowship training program. A minimum training period of 6–12 months seems reasonable. Quality microsurgical training opportunities outside of established fellowship programs are rare. Weekend microsurgery training courses may offer the opportunity to learn new techniques and brush up on established skill sets; however they are unlikely to be comprehensive enough to provide sufficient set skills, knowledge and judgment required of a contemporary urologic microsurgeon. Moreover, in the authors’ view, it is critical that surgical

skills training be achieved in the context of real patient clinical care. Despite the numerous testimonials of surgeons throughout the World Wide Web, weekend microsurgery training courses, microsurgery observerships, or short “mini” fellowships are not the same as formalized fellowship training in microsurgery. Even the most experienced microsurgeons continually reinforce that successful microsurgery is dependent upon much more than technical skill. There are critical judgments intraoperatively as well as decisions as to the best type of procedure for each patient that only come with practical experience and being involved in cases in real time. Mastery in microsurgery is a truly lifetime endeavor.

So back to the original question—*Should all urologic microsurgeons be fellowship trained?* Ideally yes. However, it is important to keep in mind that many of the pioneers in this field, those that have made some of the most important advancements, discoveries and contributions to urologic microsurgery, were not formally fellowship trained, but self-taught. Nonetheless, few would argue that a fellowship-trained specialist in urologic microsurgery represents the highest standard of surgical training and education. Such standards may be achieved without fellowship training as experience is obtained over time, however fellowships may serve to facilitate a surgeons progress and trajectory on the surgical learning curve [24, 25]. As access to medical information and self-advocacy increases, our patients will realize and demand such high standards of their surgeons. Our profession should promote and protect such high standards.

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