

SURGERY OR ASSISTED REPRODUCTION? A DECISION ANALYSIS OF TREATMENT COSTS IN MALE INFERTILITY

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ABSTRACT

Purpose: Assisted reproductive technology (ART), including in vitro fertilization and intracytoplasmic sperm injection, is routinely used to treat male factor infertility. Because of the success of ART, the optimal method to achieve pregnancy with male infertility is controversial. Two examples in which ART competes with traditional male infertility treatments are varicocelectomy and vasectomy reversal. We used formal decision analysis to estimate and compare the cost-effectiveness of surgical therapy and ART for varicocele and vasectomy reversal.

Materials and Methods: Decision analysis models were created for infertile men seeking paternity with varicocele and with post-vasectomy obstruction. Outcome probabilities applied to the model were derived from institutional and published sources. Costs of interventions were calculated from institutional data. Sensitivity analyses determined which elements were most important and, thus, were used to calculate threshold values.

Results: Vasectomy reversal is as cost-effective as ART if bilateral vasovasostomy can be performed. However, if unilateral or bilateral vasoepididymostomy is required, sperm retrieval/intracytoplasmic sperm injection may be more cost-effective due to lower patency rates. Vasectomy reversal is more cost-effective across all pregnancy rates provided that patency rates are greater than 79%. Surgical repair of varicocele is more cost-effective when the postoperative pregnancy rate is greater than 14% in men with a preoperative total motile sperm count of less than 10 million sperm and greater than 45% in men with greater than 10 million total motile sperm.

Conclusions: A decision analysis based comparison of ART and classic surgical therapy suggests that varicocelectomy and vasectomy reversal are the most economical treatments in many cases of infertility due to these lesions. Tailoring the decision models to individual centers permits more accurate comparisons using specific costs as well as the surgical outcomes and results of ART.

KEY WORDS: infertility, male; decision support techniques; reproductive techniques, assisted

Infertility affects between 10% and 15% of couples in the United States and male infertility underlies half of the cases. The advent of assisted reproductive technology (ART) has revolutionized infertility treatment by providing a viable alternative to classic male infertility treatment. Specifically in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI) allow us to overcome even the most severe defects in spermatogenesis in which only a few sperm are available. Although they are effective, these interventions are expensive and a discussion of costs must be included in the care provided to infertile couples. Few cost-benefit studies are available to help guide physicians and patients in making appropriate decisions regarding infertility management.^{1,2}

Two clinical conditions exemplify male factor diagnoses amenable to surgical and ART treatment, namely varicocele and obstruction due to vasectomy. Varicocele occurs in 35% of infertile men and treatment with surgical ligation or embolization is an established method for improving sperm quality and pregnancy rates in infertile couples.^{3,4} However, not all patients who undergo varicocele repair conceive, making ART a viable alternative strategy for family building. Vasectomy is a common birth control method in the United States but 2% to 6% of men seek future fertility after the procedure. Fertility after vasectomy is possible with surgical reconstruction or sperm retrieval and ART.

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Although ART offers a successful pregnancy alternative to varicocelectomy and vasectomy reversal, the optimal method for achieving pregnancy remains controversial. Many reproductive endocrinologists routinely apply ART in men with vasectomy and varicocele associated infertility. However, in studies that compared the costs of microsurgical reconstruction and varicocelectomy to those of sperm retrieval/ICSI classic surgical therapy was viewed favorably.^{2,5} With such strong opinions and scarce data the ability of couples to intelligently navigate their reproductive options is limited. Therefore, we clarified the cost-effectiveness of management options for vasectomy and varicocele associated infertility using decision analysis modeling.

Decision models are constructed with predefined assumptions and they serve as useful tools for estimating outcomes when multiple complex treatments are available. In urology decision analysis modeling has been applied to prostate cancer treatment to clarify the critical variables involved in treatment decisions.⁶ In this study we applied formal decision analyses to calculate the cost of pregnancy for initial surgical or initial ART treatment in men with infertility due to varicocele and vasectomy.

MATERIALS AND METHODS

Our analyses addressed the initial decision of whether to intervene surgically or use ART in cases of vasectomy reversal or varicocelectomy. Two algorithms were created to model treatment decisions and their outcomes for each urological