Chapter 10
Cost-Effectiveness of Varicocele Treatment

Cost-effectiveness analysis (CEA) is a form of economic analysis that compares the relative costs and outcomes (effects) of two or more courses of action. The cost-effectiveness of a therapeutic intervention is the ratio of the cost of the intervention to a relevant measure of its effect. Cost refers to the resources expended for the intervention, usually measured in monetary terms, while the measure of effects depends on the intervention being considered.

In the context of infertility related to varicocele, the relevant outcome is pregnancy or live birth per group of treated couples. Considering that most infertility treatments are partially or not covered by insurance plans the cost of treatment will be influenced by the payer source. An analysis of various treatment strategies including observation, varicocele repair, intrauterine insemination (IUI), and in vitro fertilization (IVF), either as a first option or after failures of other options showed that the cost-effectiveness depended on the payer source [295]. In addition, various other costs can be considered beyond the direct cost of medical care, including costs of multiple gestation and complications, which may impact the usefulness of such models.

In 1997, Schlegel reported cost estimates per delivery to evaluate the cost-effectiveness of ART by use of IVF with intracytoplasmic sperm injection (ICSI) as a primary treatment for varicocele-associated infertility in the United States [296]. The cost per delivery with ICSI was found to be 89,091 US dollars (USD) (95% CI, 78,720–99,462), whereas the cost per delivery after varicocelectomy was 26,268 USD (95% CI, 19,138–44,656). The authors’ data indicated that treatment of varicocele-associated infertility by varicocelectomy is more cost-effective than primary treatment with ART.

Penson et al. [295] also performed a cost-effectiveness analysis of treatment for varicocele-related infertility studying 4 treatment strategies, namely observation, surgical varicocelectomy followed by in vitro fertilization (IVF) if unsuccessful, gonadotropin-stimulated intrauterine insemination (IUI) followed by IVF if unsuccessful, and immediate IVF. The main outcome measure was incremental cost per live delivery of any number of newborns. Immediate IVF cost more per live delivery and was less effective than varicocelectomy followed by IVF if unsuccessful,
or IUI followed by IVF if unsuccessful. When electing the latter 2 procedures, the preferred approach depended on the payer. IUI followed by IVF was the most cost-effective approach from the patient’s perspective, as its final cost was a few hundred dollars less than varicocele repair followed by IVF [295]. From the healthcare payer perspective, however, each additional live birth that resulted from electing IUI/IVF over varicocelectomy/IVF cost $561,423.

Later in 2005, Meng et al. [297] reported decision analysis models for infertile men seeking paternity with varicocele in which cost of interventions were based on institutional data in the United States. The first decision was the choice between varicocelectomy and ART, and the cost per pregnancy was the end point for comparing the outcomes. In the authors’ institution, of all patients, 36.6% of couples achieved natural pregnancy after surgery, but the probability varied according to preoperative total motile count. The pregnancy rate for a single ICSI cycle and 4 IUI cycles was assumed to be 30 and 32%, respectively. Overall, surgical repair was more cost-effective than ART. However, the authors noted that surgical treatment was more cost-effective than ART in certain cases of varicocele-associated infertility. If in a surgeon’s experience men with a less severely-impaired preoperative motile sperm count (greater than 10 million motile sperm) cannot achieve a 45% pregnancy rate after surgery, ART can be more cost-effective. This is largely due to the relatively inexpensive IUI procedure for which such couples may qualify. On the contrary, if a surgeon can achieve a greater than 14% pregnancy rate in men with more severe impairment in semen quality (less than 10 million motile sperm), varicocele repair is more cost-effective since these couples generally require ICSI instead of IUI to overcome infertility. The authors however, neither provided data about duration of follow up and time to achieve pregnancy, nor considered other factors such as the number of children desired, the social and monetary costs of intervention in the female partner, the cost of time lost from work or the costs attributable to procedural complications and multiple gestations.

In Korea, Kim [298] suggested that the cost per delivery with ICSI was approximately 16,382,448 Korea Won (KRW) (14,893 USD), and the cost per delivery after varicocelectomy was 11,587,675 KRW (10,534 USD). However, under their national health insurance system, the patient’s co-payment after varicocelectomy was 5,258,106 KRW (4780 USD) and 14,977,969 KRW (13,616 USD) after ICSI. These authors advocated varicocelectomy as the first-line infertility treatment because it was more cost-effective compared to ART.

Although most cost-effectiveness studies favor varicocelectomy over assisted reproduction, there are factors that cannot be assigned a monetary value but may be very significant to a given couple. Some couples value the immediacy of ART over the time required for natural conception while others feel that there is a premium on conceiving by the ‘most natural’ means possible that influence their decision for varicocele repair.
Key Points

1. The cost-effectiveness of these various treatment options for varicocele is a vital issue considering that infertility treatments are often not covered by insurance plans and therefore may be an ‘out-of-pocket’ expense to the patient.
2. Most studies favor varicocelectomy over assisted reproduction even without accounting for the beneficial effect of varicocelectomy beyond the treatment period.
3. Immediate IVF cost more per live delivery and was less effective than varicocelectomy/IVF or IUI/IVF.
4. An analysis of various treatment strategies including observation, varicocele repair, IUI, and immediate IVF, with IVF offered after failures of other options, showed that the most cost-effective approach depended on the payer source whether the healthcare payer or patient’s perspective.