Abstract

Male sterilization (vasectomy) is the most effective form and only long-acting form of contraception available to men in the United States. Compared to female sterilization, it is more efficacious, more cost-effective, and has lower rates of complications. Despite these advantages, in the United States, vasectomy is utilized at less than half the rate of female sterilization. In addition, vasectomy is least utilized among black and Latino populations, groups with the highest rates of female sterilization. This review provides an overview of vasectomy use and techniques, and explores reasons for the disparity in vasectomy utilization in the United States.
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1. Introduction

Vasectomy is under-utilized despite being one of the safest, simplest, most cost-effective, and most efficacious contraceptive methods. Worldwide, less than 3% of married women of reproductive age rely on their partner’s vasectomy for contraception [1,2]. Female sterilization is approximately twice as common as vasectomy in the developed world, 8 times more common in Asia, and 15 times more common in Latin American and the Caribbean [3]. Vasectomy is more common than female sterilization in only five countries — Bhutan, Canada, the Netherlands, New Zealand and Great Britain [1,2]. New Zealand has the highest vasectomy prevalence among married couples of reproductive age at 20% [3].

2. Vasectomy is underutilized in the United States

Despite the overall increased health risk and cost, female sterilization is the preferred method of sterilization among couples in the United States. Overall, approximately 17% of women between the ages of 15 and 44 years have had tubal sterilization, while only 6% rely on male sterilization for contraception [4]. From the 2006-2008 National Survey of Family Growth (NSFG) in the United States, approximately 10.3 million women used female sterilization and approximately 3.7 million men used male sterilization as their form of contraception [4]. Interestingly, although the United States population of men is extremely diverse, men who select vasectomy are mostly non-Hispanic, white, well-educated, married, are of high economic status and have access to insurance [5]. Minority, low-income and less educated men are a small proportion of those with a vasectomy.

2.1. Vasectomy technique

From a surgical perspective, vasectomy has evolved to include several distinct steps: administration of anesthesia, delivering and isolating the vas deferens from the scrotum and vasal occlusion. Currently, the standard anesthesia for a no-scalpel vasectomy (NSV) is a vasal block with 5–8 mL of lidocaine without epinephrine given with a 25- or 27-gauge 1 1/2-in. needle [6]. Suggested improvements to this technique to minimize pain during vasectomy have included using EMLA (eutectic mixture of local anesthetics) cream alone or as an adjunct to infiltration anesthesia, buffering anesthesia, spermatic cord block, the no-needle jet injector technique, and a mini-needle technique [7–15]. Overall, pain during vasectomy is well-controlled. On a 10-cm
visual analog, pain ranged from 0.1 to 2.7 cm for methods cited above [9,11,13–17].

Prior to the development of the NSV in 1973 [18], incisional techniques were used to isolate the vas deferens. However, compared to incisional vasectomy, NSV is associated with lower rates of hematoma formation, less bleeding, fewer infections and shorter operative time [19–22]. A randomized trial of 1203 men comparing the two techniques found complications occurred less often with NSV (0.4/100 procedures) than with an incisional technique (3.1/100, p<.001). In addition, operating times were shorter for NSV than incisional vasectomy [19]. Though NSV has been increasing in popularity in the United States and worldwide [18,19,23], only 48% of vasectomy providers in the United States reported using the NSV technique in 2002 [24].

Various surgical approaches for vasal occlusion are used today. Ligation and excision is the most common method used worldwide, though it is considered by many the least effective [25]. Approximately 18% of vasectomies in the United States are performed by ligation and excision [26,27]. Other methods to improve vasal occlusion have included electrical and thermal cautery of the vas lumen, vasal irrigation, and interposition of fascial tissue between the exposed vas segments known as fascial interposition (FI). Though direct comparison of methods is difficult, several studies and a Cochrane review have suggested that cautery combined with FI is the most effective occlusion technique [20,28–30]. In the United States, 46% of physicians utilize FI [24].

3. Comparison of vasectomy to tubal ligation

To compare failure rates of vasectomy with other contraceptive methods, the rate of pregnancy post-vasectomy is used. Other definitions of vasectomy failure such as persistent motile sperm will be discussed further below. Vasectomy has a failure rate (defined by post-procedure pregnancy) of 0.15% in the first year, which is comparable to failure rates of long-acting reversible contraceptives (LARC) available for women [31]. The US Collaborative Review of Sterilization (CREST) study showed similar cumulative probability of pregnancy for male (11.3 per 1000 procedures at Years 2, 3 and 5) and female (7.5–36.5 per 1000 procedures at year 10) sterilization [32,33]. While the CREST study followed a group of 573 women with vasectomized partners, it did not specifically address the issue of azoospermia. In contrast to vasectomy, the failure rates of other male contraceptive methods are much higher, after 1 year of typical use, the male condom has a 15% failure rate, withdrawal 27%, spermicides 29% and periodic abstinence 25% [31]. These high failure rates are due, in part, to the absence of LARC methods for men. In fact, the only long-acting contraception available for men is male sterilization.

Both vasectomy and tubal ligation should be considered permanent procedures, with comparable reversal rates. Vasectomy reversal successfully returns sperm to the ejaculate in 70–90% of cases and with 40–60% of couples reporting pregnancy [34–36]. The range of pregnancy success from reversal of tubal ligation is similar with rates between 42%–74% [37–39]. In both vasectomy and tubal ligation, pregnancy success after reversal may depend on surgical technique, patient age and time since sterilization [40–42]. Approximately 6% of both men and women will request reversal within 5 years after sterilization [43–45]. For both methods, regret is higher among those of younger age [35,43–46].

One difference between tubal ligation and vasectomy is the immediate effect of tubal ligation. Vasectomy efficacy, on the other hand, is not immediate. Before relying on vasectomy as a method of contraception, men must complete post vasectomy semen analysis (PVSA). While PVSA protocols vary, evidence supports a single sample showing azoospermia after 3 months and at least 20 ejaculations is sufficient to determine if the vasectomy is effective [47]. Vasectomy success is considered azoospermia in the PVSA. At 3 months, between 51–98% (median 81%) of men will achieve azoospermia. When sperm is persistent at 3 months, a second PVSA should be obtained to determine vasectomy success. In studies that included measurement of azoospermia greater than 3 months post-vasectomy, only 1–2% of patients were found to have persistence of spermatozoa (motile or nonmotile) after 6 months [48,49]. Patients with persistent nonmotile sperm in PVSA are typically considered infertile and are not considered vasectomy failures [50].

Vasectomy failure, defined by persistent motile spermatozoa at 6 months post-vasectomy, is approximately 0.4% [47]. As described above, when using the clinical outcome of post-vasectomy pregnancy, the failure rate is 0.15% in the first year.

Though both male and female sterilization are cost-effective compared to other contraceptive methods, vasectomy is more cost-effective, with an average vasectomy costing one third as much as a tubal ligation [51,52]. A cost analysis of sterilization from a societal viewpoint has predicted that if the number of tubal ligations and vasectomies were equal, potential annual savings in the United States would be $266 million in procedure cost alone and $13 million additional savings in postoperative complication management [53].

While both male and female sterilization are extremely efficacious and cost-effective, they differ substantially in surgical risk. Interval laparoscopy tubal ligation requires entry into the peritoneal cavity and compared to vasectomy, incurs higher risk due to the invasive nature of the procedure. Compared with vasectomy, tubal ligation is 20 times more likely to have major complications [51,53]. Though procedure-related mortality is extremely rare, it is estimated to be 12 times higher with tubal ligation than male sterilization [53,54].
Newer methods of hysteroscopic transcervical female sterilization are similar to vasectomy in that they are not immediately effective and require additional testing before relying on them as a method of contraception [55]. One advantage of hysteroscopic transcervical sterilization is that it can be office based and is less expensive than laparoscopic tubal ligation [56–58], but may require additional equipment and can be more expensive than vasectomy. In addition, hysteroscopic transcervical sterilization is not readily available for low-income populations and populations with limited access to insurance.

4. Disparities in sterilization

While the overall underutilization of vasectomy compared to female sterilization is notable, the pronounced differences in vasectomy utilization among various race/ethnic groups are particularly striking. There are patient, provider and systems level factors which may contribute to these disparities.

4.1. Patient-level factors

In regards to patient-level factors, studies have shown that even after adjusting for reproductive history and demographic characteristics (e.g., insurance status, marital status, and socioeconomic status), racial differences in sterilization utilization persist. In particular, black and Latino men are less likely to rely on vasectomy for contraception than white men [5,24,59–62]. While combined female and male sterilization rates are approximately 23-24% in all racial/ethnic groups, significant differences in distribution of the two types of sterilization exist across racial/ethnic groups. This disparity is most marked in non-Latino black populations where 22% of women rely on female sterilization while only 1% rely on male sterilization. In Latino populations, 20% use female sterilization, while 3% use male sterilization. Though the gap between female and male sterilization is smaller in the non-Latino white population, it is still significant with 15% using female sterilization and 7% using male sterilization [63,64]. These differences in vasectomy rates are not explained by increased rates of female sterilization among black and Latino women [65]. However, in one study using the 2002 NSFG, the significantly increased odds of undergoing sterilization for African American and Hispanic women compared to white women were attenuated to nonsignificance after adjustment for unintended pregnancy. This suggests that the experience of an unintended pregnancy may contribute to a woman’s decision to pursue female sterilization which is highly and immediately effective as well as independent of their partner. Since unintended pregnancy is more common among minority women, this may partially explain increased rates of female sterilization among minority women [65,66]. While this may explain racial/ethnic differences in female sterilization, it does not explain low utilization of vasectomy among blacks and Latino populations.

Previous research has examined several hypotheses which may explain racial disparities in vasectomy utilization:

4.1.1. Knowledge and attitudes towards contraception

In one study, knowledge and attitudes around vasectomy were examined in Latino men compared to white men. This study showed that only 54% of Latino respondents knew what a vasectomy was compared with 96% of white respondents [67]. In a study of contraceptive knowledge in black and white women who had already received female sterilization, black women endorsed more myths about female sterilization than white women. Black women reported more frequently that tubal reversal could easily restore fertility (58.9% vs. 39.7%, p<.001) and female sterilization would reverse itself after 5 years (55.3% vs. 20.8%, p<.001). Black women had a lower mean correct score even after adjusting for confounders [68].

4.1.2. History of involuntary sterilization

It is important to consider sterilization within the historical context of involuntary sterilization among minorities in the 1960s and 1970s [69,70]. One study found that African American men held more negative views about birth control than African American women. Men’s negative contraceptive beliefs were associated with not using birth control [71]. In a survey of African Americans, black men gave both male and female sterilization significantly poorer ratings (p<.05) than black women [72].

4.1.3. Contraceptive responsibility

The 1991 National Survey of Men identified racial differences in male perception of contraceptive responsibility [73]. Black men were more likely to view contraceptive decisions as a woman’s responsibility. Latino men were more likely than non-Latinos to perceive men as the decision-makers regarding contraception.

4.1.4. Union stability

Studies that have addressed union stability as contributory to low vasectomy rates have found that even among continuously married couples, minority men are less likely to undergo sterilization than their white counterparts [59–61].

4.1.5. Ideas of masculinity

Differences in ideas of masculinity have been cited as a reason for varying use of vasectomy, however in a study of Latino and white men, few men from either group endorsed survey items that included loss of masculinity as a reason to avoid vasectomy [67].

4.2. Provider-level factors

Provider-level factors, such as differential counseling, may also contribute to racial differences in vasectomy utilization. Studies have shown differences in patient counseling and clinical recommendations by race/ethnicity,
even when controlling for patient factors and access to care [74–81]. Differences in communication styles have also been noted when comparing physician communication with African-American patients to white patients. African American patients rate communication with their physician as more dominant, less participatory and less patient-centered than white patients [82–84]. Few studies have examined sterilization utilization from this perspective. In a study examining the relationship between race/ethnicity and receipt of sterilization counseling using 2002 NSFG data, only 2.5% of men who reported no intention for additional children received any sterilization counseling. However, this low rate of counseling was not statistically different across racial/ethnic groups [85]. In contrast, another study using the 2002 NSFG data showed that minority women were more likely to receive counseling about sterilization and other birth control methods, even when controlling for access to family planning services [74].

4.3. Systems barriers

Two studies have investigated barriers to vasectomy services. One study is an unpublished, national survey of US public sector and managed care settings by Engender Health in 2001. The survey was sent to administrators and providers selected randomly from professional organization lists. Their study suggests that lack of infrastructure, funding and trained staff were the most frequently cited reasons for not providing vasectomy services or referrals. Nearly half of both administrators and providers felt men would not use reproductive health services even if they were available.

In the 2007–2008 annual report of California’s Family PACT (Planning, Access, Care and Treatment), denied claims were a significant barrier to vasectomy services. Family PACT is a state-funded program that provides no-cost family planning services (including vasectomy) to men and women with incomes less than 200% the federal poverty level. Though there is no cost to the clients for sterilization, claim denials have caused some clinics to discontinue services. In their 2007–2008 report, 28% of clients that had vasectomy services had their claims denied. This was slightly improved from a 33% denial in 06/07. Some claim denials were attributed to incomplete completion of the consent form (PM 330) imposed by the Federal government. Incorrect completion of the forms led to claim denials and sterilization services could not be reimbursed by Family PACT.

Our system of contraceptive counseling, which is often geared towards women, may also contribute to underutilization of vasectomy. In the Engender Health survey cited above, providers commonly reported the lack of male clients in their practice as a reason not to regularly discuss male sterilization as a contraceptive option. Additionally, providers were focused on methods they were able to provide themselves. In the United States, 79% of vasectomies are performed by urologists, followed by 13% performed by family physicians and 8% by general surgeons [24]. Thus, obstetrician-gynecologists who perform female sterilizations may not include vasectomy counseling with their clients since they may not perform vasectomy themselves and have a primarily female clientele.

5. Discussion

The choice of sterilization method has important health implications for individuals and important economic impact on society. Hence, it is vital that access to sterilization for men and women who have completed their childbearing becomes readily available. As family planning providers, it is important to understand techniques and complications and be able to effectively compare the sterilization methods available. Providers must also be able to identify barriers to vasectomy in order to advocate for and counsel patients appropriately regarding their reproductive options. Studies which further our understanding of vasectomy barriers and, in particular, the racial and ethnic disparities of sterilization use and access are needed to allow men and women to make an informed decision about their contraceptive choices, ultimately selecting methods that are most appropriate for their needs.

Vasectomy is an extremely safe and effective method of contraception. It is incumbent upon the family planning community to maximize its availability and acceptance. Achieving this goal will require a focused and sustained effort which will be rewarded by more men obtaining the most effective method of permanent contraception and more women avoiding unnecessary surgical procedures.

References


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