

## Male Contraception in Korea<sup>1</sup>

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**= Abstract =** The contraception practice rate in Korea has steadily increased from 9% in 1964 to 72% in 1987. Accordingly, natural increase rate of population declined from 28.4 per 1,000 in 1964 to 12.4 per 1,000 in 1987. Notably in recent years, the acceptance of surgical contraception services has sharply increased in this country. Now the author analyzes various factors influencing successful vasectomy based on his experience in performing more than 8,000 vasectomies and 1,000 vasovasostomies during the past 25 years. These various factors consist of preoperative screening interview, surgical vasectomy technique, vas irrigation technique, open-ended vasectomy, complications from vasectomy, failure of vasectomy, sperm granuloma formation, spermatogenesis and steroidogenesis after vasectomy, immunological consequences after vasectomy, prostatic diseases and vasectomy, late post-vasectomy syndrome, psychological effects after vasectomy and success rates of vasovasostomy. Besides, the author makes more comments on the results of the clinical trials on new approaches to reversible vas occlusion technique with a new device of Intravasal Thread and to reversible suppression of spermatogenesis with long-acting sex hormones.

**Key words:** *Vasectomy, Vasovasostomy, Reversible vas occlusion, Reversible contraceptive injection*

### INTRODUCTION

The contraception practice rate in Korea has steadily increased from 9% in 1964 to 72% in 1987 (population: 41,569,000, 1987). Accordingly, natural increase population rate declined from 28.4 per 1,000 in 1964 to 12.4 per 1,000 in 1987. Notably in recent years, the acceptance of surgical contraception services has sharply increased in this country. Contraception practice rate of methods estimated by Ministry of Health and Social Affairs, Republic of Korea in 1987 is shown as follows: oral pill, 4.2%; IUD, 7.4%; condom, 7.4%; menstruation regulation, 9.7%; vasectomy, 10.4%; tubectomy, 33.3%; and no practice, 27.6%.

### Male Surgical Contraception (vasectomy, male sterilization)

Vasectomy, male sterilization, or male surgical contraception has been an accepted method of contraception in Korea since the end of 1962 because it is effective, safe, simple, and inexpensive method with few complications. By the end of 1987, about 1,060,000 men were voluntarily vasectomized through the government aid (free-service) programme. It is estimated that an additional 400,000 men underwent the procedure at their own expense through private practitioners in this country. Consequently, about 18% of the married women, 15 to 44 years of age who used contraception were supposed to rely on the surgical contraception of their male partners in Korea. The use of vasectomy for surgical contraceptive purposes has grown rapidly not only in Korea, but also in other parts of the world as well. It has been

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estimated that about 50 million men were using vasectomy in the world and that more than 8 million men underwent vasectomy in the United States alone (Linnet 1983). According to the Survey of Family Growth, 15.4% of married eligible women relied on the sterilization of the male partners in the States (Kendrick and Rubin 1986). Thus, a worldwide evaluation of various aspects of vasectomy and a standardized guide directory are needed for high-quality services of vasectomy to meet the increasing demands of the procedures. This report deals with a general evaluation of the important factors influencing successful vasectomy with no complication based on the author's experience in performing more than 8,000 vasectomies and 1,000 vasovasostomies during the past 25 years at the Department of Urology, Seoul National University Hospital.

#### **Preoperative screening interview:**

Before performing a bilateral partial vasectomy, a careful preoperative interview of the clients and their wives were done. The preoperative assessment is to determine the clients fitness for vasectomy and to identify any conditions that may increase the risk of the procedure. The information and counseling sessions before the surgery included explanation of benefits and risks of the procedure with special attention to their failure rate, types of postoperative complications, specific long-term side effects and possibility of reversal operation. The man should be told that vasectomy does not affect normal sexual potency, physical and mental health; "freedom-giver and worry-killer."

**Surgical technique:** The principle of vasectomy has remained the same since the first operation was attempted on a man by Lennander in 1894, but many different techniques have been developed in an attempt to find simpler and safer techniques that provide complete protection against the passage of sperm and improve the chances of later successful reversibility. Under a local anesthesia, a straight part of the vas deferens is exposed through a single scrotal median incision and is bluntly isolated from the surrounding tissues using Lee's Vasectomy Hook (Lee 1968). The isolated vas is then treated by tying cut ends of the vas back on themselves in an effort to prevent spontaneous recanalization and sperm granuloma formation. It has been reported that the contractile and secretory activities of vas deferens in regard to maturation, motility and transport of spermatozoa are controlled

by norepinephrine which released from the sympathetic nerve endings running through the fascia. Therefore, the neuromuscular sheath (adventitial cremasteric fascia) of the vas deferens should be incised longitudinally rather than divided transversely during vasectomy (Dixon *et al.* 1987).

#### **Vas irrigation technique:**

In order to produce immediate sterility or to shorten the interval between vasectomy and sperm-free ejaculate, the distal vas was irrigated with about 7 ml of spermicidal solution (KMnO<sub>4</sub>, 0.001%; rivanol, 0.001%) just before the ligation of the vas during vasectomy. This technique permitted a vasectomized man to be sterile immediately after his vasectomy, since the residual sperm in the distal ductal system were killed and washed out into the bladder (Lee 1974). However, it has been reported that immediate sterility cannot be guaranteed by using vas irrigation as an occasional failure might be caused by some anatomical variation in the men concerned (Mumford and Davis 1979).

#### **Postoperative semen analyses:**

The sperm remained or stored in the reservoirs (ampulla of vas deferens) and distal ductal system are gradually expelled with each ejaculation after vasectomy, eventually resulting in a sperm-free ejaculate (Lee 1973). More than 15 ejaculations should be experienced or more than 3 months passed after vasectomy (Tailly 1984) before free intercourse might be allowed. The author's study indicated that semen analysis just before vasectomy was proved to be beneficial to shorten the period till sperm-free ejaculate, to avoid unnecessary vasectomy on the patients who became azoospermic after the previous impregnation, to minimize the abstinence period between last coitus before vasectomy and first coitus after vasectomy and to establish prevasectomy semen quality for later vasectomy reversal operation.

#### **Open-ended vasectomy:**

Leaving open the proximal (testicular) end of vas at vasectomy may reduce symptoms of epididymal congestion and improve the success rate of vasectomy reversal but might increase the incidence of painful sperm granulomas and spontaneous recanalization after vasectomy. In some case, the proximal end of vas was obstructed by overgrowth of a fibromuscular cap (Errey and Edwards 1986; Goldstein 1983; Lee 1967). Therefore, no sustained differences were seen in the incidence of sperm granuloma or in the response of the testis or

epididymis to either standard or open-ended vasectomy technique.

#### **Complications (short-term effects) from vasectomy:**

In the author's series, complications or early effects of vasectomy appeared as follows: pain (1%), hematoma (0.2%), ecchymosis (3%), and infections such as epididymitis, vasitis, funiculitis, cellulitis, abscess, etc (3%) (Lee 1980).

#### **Failure of vasectomy:**

Unsuccessful fertility termination after performance of vasectomy, as evidenced by presence of sperm in the seminal fluid caused by spontaneous recanalization of cut ends of the vas through the sperm granuloma, division of the wrong structure other than vas, congenital duplication of a vas (incidence: 0.005%) and residual or stored sperm in the distal ductal system. The failure might be mostly caused by spontaneous recanalization and was found in 0.4% of the author's series. One pregnancy occurred 3 years after vasectomy due to late recanalization (he was sterile by 2 consecutive azoospermia 4 months after his vasectomy).

#### **Sperm granuloma formation:**

A sperm granuloma, a local inflammatory response, is a nodule of scar tissue containing accumulation of sperm and granulomatous tissue, occurring at the cut end of the vas or in the epididymis either shortly after or years after vasectomy. It is caused by inadequate occlusion of the vas during vasectomy, absorption of ligatures before scar tissues have been formed after vasectomy, buildup of pressure behind the cut end of the vas after vasectomy, rupture of epididymis after vasectomy or infection of the vas leading to tissue necrosis after vasectomy. Sperm granulomas were found in 50% of the removed vasectomy scar nodule when the reversal operation was attempted in the author's series. Sperm granuloma is usually asymptomatic, but may be troublesome if it causes spontaneous recanalization of the vas through ducts formed within the granuloma, obstructs the reanastomosed vas lumen, stimulates autoimmune reaction by absorption of sperm from the granuloma or creates vasocutaneous fistulae.

#### **Spermatogenesis and steroidogenesis after vasectomy:**

In respect of side effects (long-term complications) of vasectomy, the author's study revealed that there was no evidence of atrophy of seminiferous tubules following vasectomy in experimental

animals (Lee 1967). In the human, spermatogenesis was maintained at somewhat lower levels in the testis biopsied at vasovasostomy, but these changes were usually reversible soon after the sperm passage was restored (Jarow *et al.* 1985). Steroidogenesis in the testis was also not altered following vasectomy. No significant changes were noted in the values of plasma testosterone, luteinizing hormone, follicle stimulating hormone and seminal fructose when vasectomized men were compared with nonvasectomized men. So that, the absence of sperm passage does not involve the endocrine component of the testis.

#### **Immunological changes after vasectomy:**

Following vasectomy, there was rise in the titres of circulating sperm-immobilizing antibodies in 27% and circulating sperm-agglutinating antibodies in 50% in the author's series (Lee *et al.* 1987). The sperm autoimmunity occurred after vasectomy has generated concern about the possibility of increased risk of diseases related to immune function, but no evidence has yet been found that these antibodies linked to diseases in the author's series (Lee *et al.* 1987). There was, however, a possible negative effect on fertility rate if reversal operation was performed. Many comprehensive epidemiologic studies showed that the percentages of vasectomized and nonvasectomized men who reported a history of coronary heart disease, hypertension or stroke before the examination were also virtually identical and that there was no association of vasectomy with an increase in the occurrence or severity of atherosclerotic retinopathy. Moreover, vasectomy was not significantly associated with an increase in the risk of any of the specific immune diseases (Petitti 1986).

#### **Cancer and prostatic diseases after vasectomy:**

There has been no association of vasectomy with an increased risk of malignant or nonmalignant neoplasms and also no association with benign prostatic hypertrophy or with prostatic cancer (Sidney 1987).

#### **Late post-vasectomy syndrome:**

There is a syndrome of scrotal discomfort and pain for months to years after vasectomy, usually constant, often disabling, exacerbated by sexual activity and occasionally radiating along the spermatic cord structures. It is secondary to long-standing obstruction of the excurrent ductal system. It is noninfective in origin but it has been

treated mistakenly as chronic epididymitis, epididymo-orchitis, epididymal congestion or spermatic or epididymal granuloma for long periods without resolution. The scrotal discomfort is most likely owing to dilatation of the epididymal ducts, extravasation of sperm and sperm granuloma with ensuing inflammatory reactions. It is one of the more serious side effect or late complication of the vasectomy procedure (Selikewitz 1985). In 5 cases with the syndrome of the author's series, total epididymectomy and partial vasectomy resulted in complete relief of symptoms usually within 24 hours after the surgical therapy.

#### **Psychological effects after vasectomy:**

A mentally healthy and sexually well-adjusted normal man experienced no significant psychological changes following vasectomy if he understood the principle of the procedure before the operation. But some men of neurotic temperament have complained of impairment of general health and sexual activity after vasectomy. The majority of these victims were attributed to men with sterilization neurosis proved by psychometric test by means of Minnesota Multiphasic Personality Inventory (MMPI). In the author's series, improvements were noted in 10% on general health and in 12% on sexual behavior, whereas deteriorated effects were observed in 8% on general health and in 8% on sexual activity (Lee 1966; Lee 1970). Generally speaking, improvements in general health (7-11%) and sexual behavior (16-79%) were noted more in men of America and Europe, while deteriorated effects on general health (8-30%) and sexual activity (8-16%) were reported more in men of Asia (Lee 1980). Massey (1984) indicated that the incidence of impotence was 1.9/1000 men-years of observation in vasectomized men and 1.7/1000 men-years in nonvasectomized men and that the difference was not statistically significant.

#### **Vasovasostomy**

The increasing popularity of vasectomy led to increased demands for reversal of the procedure. It is estimated that 1 reversal operation is performed for every 500 vasectomies in Korea now. Therefore, 3,000 men with vasectomy were estimated to request the reversal procedures in this country. During the past 24 years (1964-1987), a total of 1,130 patients have undergone vasovasostomies by the author at Seoul National University Hospital. Sources of referring them to the author for the operation consisted of other physicians (35%), family plan-

ning workers (20%), other patients who have achieved pregnancy following the author's vasovasostomy (18%), mass media (12%), friends and relatives (10%) and patients' own knowledges about the surgery (5%). Reasons for requesting the procedure included remarriage (41%), death of children (37%), changes of attitude (18%) and psychological problems after vasectomy (4%). Overall results were summarized as follows: Better results were obtained when there was shorter duration of obstruction, bilateral straight vas-to-straight vas anastomosis and bilateral presence of sperm in the vas fluid during vasovasostomy. Results of end-to-end and side-to-side macrosurgical anastomosis, as well as of one-layer and two-layer microsurgical anastomosis were similar (Lee 1986). Macrosurgical success rates (1964-1978) were 85% for patency and 35% for pregnancy in the 300 cases. Microsurgical success rates (1979-1987) were 93% for patency and 58% for pregnancy in the 700 cases.

#### **Reversible Vas Occlusion Methods**

For the new approaches to reversible vas occlusion techniques, the author has developed a new device "Intravasal Thread, IVT" which is made of surgical nylon thread and is 1 to 2-cm in length and 0.4 to 0.8-cm in diameter. The device has two 8-cm long filiform threads attached to one end. (U.S.A. Patent No. 3,589,355. June 29, 1972) (Lee 1972). For the IVT insertion, (1) A 2-cm length of vas has been exposed. (2) IVT is introduced by using a straight needle attached to the free end of the filiform thread. (3) IVT has been inserted perfectly into the vas lumen. (4) Filiform nylon threads are tied just around the vas in order to hold the IVT in place in the vas. Total azoospermias were achieved in 94% of the 504 volunteers. Failure of occlusion (6%) was due to leakage of sperm around the dilated vas wearing the IVT caused by the intravasal pressure of sperm production. For the IVT removal, (1) Vas wearing the IVT is exposed. (2) Previously tied filiform nylon are cut so that the IVT can be pulled out from the vas with mosquito forceps. After removing the IVT from the vas, sperm reappeared in 35 volunteers of the 42 (3%) who were submitted to the removal procedure. Failure of patency (17%) was due to extensive fibrosis or accidental severance of the vas during the removal procedure (Lee 1972). Therefore, the author discontinued further applications of this IVT device until these problems could be solved.

Similar studies have been conducted by many investigators but no perfect device has been produced yet (Lee 1985).

### Male Injectable Contraceptive

The avenues of developing male methods of fertility regulation open to investigation were divided into three major areas: (1) Disruption of sperm formation either by a direct action on the testis or by interference with the hormonal milieu necessary for spermatogenesis including (a) impairment of the action of luteinizing hormone releasing hormone on the hypophysis, (b) immunization against follicle stimulating hormone and luteinizing hormone, (c) inhibin, (d) steroid-induced suppression of gonadotropins with use of testosterone or use of gestagen-androgen combinations and (e) direct suppression of spermatogenesis with 5-thio-glucose or gossypol. (2) Interference with epididymal maturation of sperm. (3) Interruption of sperm transport. The author has conducted the clinical trial which was designed to develop a reversible suppression of spermatogenesis with combined injections of long-acting medroxyprogesterone acetate (DMPA, depo-provera) and testosterone cypionate (depo-testosterone) on 30 normal male volunteers for 15 months at Department of Urology, Seoul National University Hospital and Institute of Reproductive Medicine and Population (WHO Collaborating Center for Research in Human Reproduction). Results were summarized as follows: Overall sperm counts of total subjects reduced from mean control counts of  $143 \times 10^6/\text{ml}$  to the lowest mean counts of  $9 \times 10^6/\text{ml}$  after drugs administration and recovered to the highest mean counts of  $105 \times 10^6/\text{ml}$  after discontinuation of drugs. Sperm counts, however, did not drop less than  $20 \times 10^6/\text{ml}$  in 3 cases 7 months after drugs exposure. Sperm counts recovered greater or equal to the lowest counts of control phase in 24 cases 6 months after drugs cessation (Lee 1979). This trial findings suggested that the lowest dose of 200 mg of depo-provera in combination with 200 mg of depo-testosterone was proved to be suitable for the reversible male contraceptives but further studies should be needed for the accuracy in the suppression and recovery of spermatogenesis.

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= 국문초록 =

## 한국에서의 남성 피임법

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이희영

한국에서는 수태조절법의 보급과 실천율이 해마다 높아져서 인구자연증가율은 1964년의 2.84%에서 1987년의 1.24%로 떨어졌다. 수태조절법중에서도 근자에 와서는 영구적이고 직접적인 외과적 불임술의 수요가 많이 늘고 있다. 따라서 저자는 우리나라 남성의 피임법에 관하여 지대한 관심을 갖게 되었다. 저자는 지난 25년간에 걸쳐 시술한 8,000 여례의 정관절제술(남성 불임술)과 1,000 여례의 정관정관문합술(정관복원술)의 치험례를 토대로 하여서 여기서 얻어낸 성공적 정관절제술과 정관정관문합술을 시술하는데 필요 불가결한 요인들을 분석 평가하여 보았다. 즉 그 요인으로서는 수술전 면담검사, 정관절제술 시술수기, 즉시피임을 위한 정관세척법, 근위정관 개방식 정관절제법, 정관절제술의 합병증, 정관절제술의 실패요인, 정자육아종 형성과 그 의의, 정관절제술 후의 고환에서의 정자형성작용과 내분비합성작용, 정관절제술이 면역학적 면에 미치는 영향, 정관절제술이 전립선 비대증과 전립선 암에 미치는 영향, 만발성 정관절제술 후 증후군, 정관절제술이 정신 심리면에 미치는 영향, 정관정관문합술의 성공율등 들 수 있다. 이들을 예의 검토하여 앞으로의 완전무결한 정관절제술과 보다 높은 정관정관문합술의 성공율을 올리는데 도움을 주도록 노력했다.

그외에도 저자가 연구한 정관내 유치사 장치로 정자통로를 가역성으로 막는 정로 차단방법의 효능과 개선점을 기술하였다.

또 데포-푸로베라와 데포-테스토스테론을 월 1회 6개월간 주사하여서 정자형성작용을 가역성으로 억제하는 남성 주사 피임법을 개발하기 위해 15개월간의 임상시험을 시도한 바 대상자의 90%에서 정자형성이 억제되었고, 약물투여중지로 80%에서 가역성으로 정자형성이 회복되었다.