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The effects of vasectomy on health

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Abstract. The study of possible adverse effects of vasectomy have been mainly focussed on hormonal balance, spermatogenesis, the induction· of auto-immune reactions and cardiovascular changes including the non-fatal myocardial infarction. The review of literature, including our own work on the immunological sequelae of vasectomy, indicates that there is no health hazard following vasectomy. The presence of antibodies to spermatozoa in some individuals, however, may effect future fertility, if reversal is requested.

Keywords. Auto-immune reactions; immuno-complexes; myocardial infarction.

Introduction

Vasectomy is one of the widely used methods of contraception in family planning programmes. There has been some concern on the sequelae of vasectomy. The immediate complications include wound infection (0·1–7·5%), hematoma formation (0·4–4·2%), symptomatic spermatic granuloma (0·4–4·2%) and epididymitis (1·8–5·6%) (Schmidt 1966; Gomel 1978). The reported psychological sequelae of vasectomy include anxiety, impotence, or exaggerated masculinity. Some individuals in fact experience a sense of well being after the operation which may be explained on psychological grounds as being due to the removal of the fear of impregnating their wives.

This review highlights some of the findings reported in the literature by other investigators and the author on the effects of vasectomy on human health.

Consequences of vasectomy

Hormonal balance

Studies on endocrine status before and after vasectomy have indicated no functional change (Naik *et al.,* 1976).

Pathological problems

Mention of thrombophlebitis, hyperinsulism and brain damage among others have been reported which are not based on any valid evidence and are generally anecdotal

Abbreviations used: CRIA, Cellular radio-immuno assay; CMI, cell mediated immune response; PHA, phytohaemogglutinin.

observations with non-controlled evaluations (Shulman, 1974). Much of the reasoning is based on the concept of auto-immunity and tissue cross-reactions, but without the use of enough data from vasectomy cases.

The seventy of post-vasectomy testicular pathology in different species, strains and individuals, depends upon the differences in immunological responsiveness, or differences in the competence of the blood seminiferous tubule barrier to exclude auto-antibodies or differences in leakage of the epithelium in post-testicular segments of the tract to soluble antigens (Lepow and Crozier, 1979). In humans, spermatogenesis continues, although sometimes at a reduced rate. Silber (1978) however, reports the possibility of a significant decrease in spermatogenesis at periods greater than 10 years.

Immunological consequences

The induction of auto-immune reactions to spermatozoa

The possibility of adverse effects related to an immune response as a result of vasectomy has been raised. Numerous studies on the immunological response to vasectomy have been reported during the last decade. After vasectomy, spermatozoa are confined to the epididymis and the vas deferens. Lacking a normal anatomical passage, the un-discharged spermatozoa either get degenerated or are phagocytosed by macrophages. Sperm cells possess multiple antigens both on their surface and internally. Normally the blood testis barrier prevent the antigens from reaching the circulation. In some pathological conditions, such as vas-occlusion the sperm antigens are solubilized due to phagocytosis and enter the hemal circulation and produce auto-antibodies.

The presence of circulating antibodies to homologous spermatozoa following vasectomy has been reported (Bigazzi, 1981; Shahani and Hattikudur, 1981). These antibodies can be detected by a number of procedures, such as sperm agglutination and sperm immobilization methods (Rose *et al.,* 1976). Recently new sensitive techniques such as indirect cellular radio-immuno assay (CRIA) (Hattikudur and Shahani, 1984) and the enzyme linked immuno-sorbent assay have been developed for the detection of anti-sperm antibodies (Rajagopal and Rao 1979). These assays being more objective in nature are found to be more sensitive when compared with former methods. Sperm agglutinating antibodies have been detected in sera as early as the third or fourth day following vasectomy (Ansbacher, 1974). However, they are readily and widely detectable for 6 weeks to 6 months post-vasectomy (Shulman *et al.,* 1972). The antibody titer increases continuously during the post-vasectomy period indicating a continuation of antigenic stimulation even after 20 years post-vasectomy (Gupta *et al.,* 1975).

The sperm immobilizing antibodies, and also antibodies to sperm nuclear protamines, may also occur as early as 3–4 days after vasectomy. The incidence of these antibodies may increase or decrease after 6 months post-vasectomy (Ansbacher *et al.,* 1976; Alexander *et al.,* 1976; Shahani *et al.,* 1983). The sera exhibiting immobilizing activity usually has agglutinating activity of moderate to high degree. There is no convincing evidence of any pathological consequences of these immune responses. There is a possibility of the development of immunological infertility in some cases and this may be of concern in cases requesting reversal of the vasectomy later.

Occasional reports on clinical sequelae of vasectomy (Roberts, 1968), have focused

the attention on a possible development of auto-antibodies other than spermatozoa after vasectomy. So far, no indication has been found that such antibodies are produced in titres comparable to those found in auto-immune diseases, neither in short-term (Hess *et al.,* 1977) nor in the long term studies (Bullock *et al.,* 1977). Hellema *et al.* (1978) in their one year and 5–6 years post vasectomy serum samples was not observed the development of somatic auto-antibodies after vasectomy.

Cell mediated immune response (*CMI*)

The possibility of local disease resulting from a CMI was also considered. Data obtained on CMI to sperm antigens are erratic and difficult to interpret. Significant decrease in stimulation of lymphocytes have been observed by phytohaemagglutinin (PHA) whereas Concanovalin A stimulation does not alter (Wilson *et al.,* 1977). Post-vasectomy period dependent incidence of migration inhibition of leucocytes is also reported (Nagarkatti and Rao 1976). Sperm *per se* may either be stimulatory or inhibitory to lymphocyte transformation when cultured with lymphocyte (Husted *et al.,* 1976, Thestrup-Pedersen *et al.,* 1976; Marcus *et al.,* 1978). In a cross-sectional study (Shahani *et al.,* 1983) undertaken to assess the long term immunological sequelae of vasectomy (with respect to humoral response as well as CMI to spermatozoa) showed that humoral response was positive in 37·5% of the vasectomized whereas the CMI response to spermatozoa was negative.

Immune complexes

Vasectomy in experimental animals including primates result in the formation of circulating immune complexes which may have an etiological role in the subsequent development of glomerulonephritis (Bigazzi *et al.,* 1976), Orchitis (Bigazzi *et al.,* 1976; Tung and Alexander 1980; Anderson and Alexander 1981) or atherosclerosis (Alexander and Clarkson, 1978; Clarkson and Alexander 1980). The occurrence of circulating immune complexes following vasectomy in man, however is much less clear. Shahani *et al.* (1983) observed the presence of circulating immune complexes in 12 % of the vasectomized subjects and 4 % of the controls. Further they observed that 59·3 % of the vasectomized men who showed the presence of circulating immune complexes were negative to the presence of antibodies to spermatozoa.

Recently Witkin *et al.* (1984) observed that circulating immune complexes develop for a transient period of 2–3 months following vasectomy. This transient appearance of these complexes occurs only in some men and the reasons for this is not known. According to Witkin *et al.* (1984), the possible explanations for the lack of circulating immune complexes at later times post-vasectomy may be due to leakage of sperm components was minimized by the infiltration of macrophages and plasma cells into the genital tract or that under conditions of large antibody excess immune complexes are rapidly cleared from the circulation by the reticuloendothetial system. The significance of transient immune complexes formation following vasectomy on circulating immune complexes mediated disease process in susceptible individuals remains to be determined.

Complement and immunoglobulins were associated with atherosclerotic plaques in some of the vasectomized animals. It has been hypothesized that the immunological

response often accompanies vasectomy may excerbate atherosclerosis. Increase in severity of atherosclerosis is due to the increased permeability of the endothelium where the immune complexes get deposited (Alexander and Clarkson 1978). Further, the severity observed in atherosclerosis does not depend upon the diet status but could be due to the circulating immune complexes (Clarkson and Alexander 1980).

Non fatal myocardial infarction

Animal studies carried out during the late 1970 suggested that vasectomy increased the severity of atherosclerosis. The hypothesized mechanism of action was that the circulating immune complexes containing antibodies to spermatozoa would damage inner arterial wall.

Direct information on fatal myocardial infarction and vasectomy in humans is yet to be provided. Walker *et al.* (1981) observed that the incidence of non-fatal myocardial infarction among 4830 vasectomized men was 0·9 cases per 1000 man years during 244420 man years of observation. This was slightly lower than the rate in 24150 non-vasectomized men, matched with vasectomized men for calender year of birth and duration of observation. They further observed that the reviewing of medical records for a matched sample of study subjects indicated no measurable findings of important cardiac risk factors. Clinical and epidemiologic research has failed to demonstrate any association between vasectomy and atherosclerosis in humans as manifestations of cardiovascular disease (Perrin, 1984).

The recent NIH report (Perrin, 1984) indicates that vasectomy does not predispose men to coronary heart disease, even after long duration of the procedure or with elevated levels of antisperm antibodies in their blood streams.

The large cohort study by Massey *et al.* (1984) does not support the suggestions of immune-pathological consequences of vasectomy except for epididymitis and orchitis within the period of follow up. The incidence of diseases was observed to be similar for vasectomized men and their paired controls or higher for the controls. This was true not only for the individual disease but also for the diseases and conditions in which a particular immunopathological mechanism (antibodies, immune-complexes or sensitized cells) might conceivably operate.

Thus from the review of the literature it seems that there is no health hazard following vasectomy. However, the presence of immobilizing and agglutinating antibodies to spermatozoa in some of the individuals may affect future fertility if reversal is requested.

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