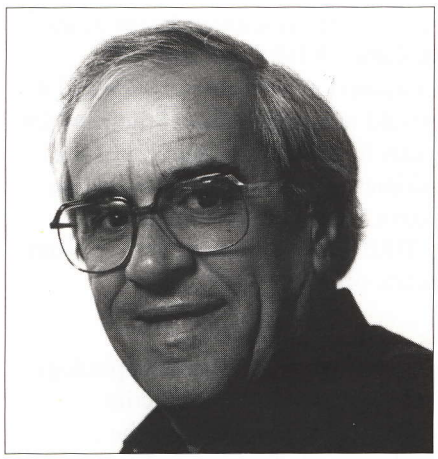
Sexual Dysfunction in Male Diabetics: Part 2 — Dr LI Robertson



Dr Mac Robertson
MBChB, MFGP (SA)

Curriculum Vitae

Dr LI Robertson studied at Cape Town University where he received the MBChB in 1954. He did some post-graduate training at McCord Zulu Hospital (Durban), at St Monica's Home (Cape Town), received the MFGP(SA) in 1975 and has been in Private Family Practice in Durban since 1957. He has a wide interest in different fields of medicine, and at the moment still holds the following posts: Senior Medical Officer – Diabetes Dept (Addington Hospital), Medical Director – Child Guidance & Research Centre (Durban/Westville), Medical Director – Institute of Human Sexuality. He also makes time to serve on several committees. He is Vice-chairman of the council of SA Academy of Family Practice/Primary Care; he is an elected member of the SA Medical and Dental Council and gives time to many other committees serving the community. Dr Robertson has presented many papers at Medical Conferences, has published several scientific papers and contributed to two medical textbooks. He is married to Barbara and they have 4 children.

Summary

The author discusses some interesting new developments and controversies in the field of sexual difficulties in diabetic males. He sees the most important development of the last decade to be the introduction of vasoactive agents for intracarvernosal use (Iraq 1982). The use of phentolamine, papaverine and prostaglandin have helped in the diagnosis and management of erectile disorders. He explains what penile erection really is – its physiology and neurochemistry and what its dysfunction is based on: two major risk factors being diabetes mellitus and lipid dysfunction. Whilst some males have mainly psychological aetiology, others have neurogenic impotence or cavernosal dysfunction which may need surgery. He concludes, though, that tenderness and security are needed in the sexual encounter and may even counteract some physiological deficit.

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Diabetes Mellitus; Male; Sex Disorders; Penile Erection.

Approximately a third of our male diabetics have sexual problems, ranging, early on, from retarded ejaculation, (which responds very nicely to simple therapy with sympathomimetics, either Ephedrine HCl or, if you want to be more fancy, Eskornade taken before coitus), to severe erectile dysfunction.

In this paper I would prefer not to simply do the usual trite runthrough of the causes of sexual difficulties in our diabetics or the work-up necessary to decide on the likely pathogenesis. One would have to admit, in fact, that the suggested list of investigations such as NPT or Doppler-flow studies leave much to be desired. Dopplers are only able to measure flow through the dorsal arteries and not the helicine arteries, somewhat akin to assessing the posterior tibials or dorsalis pedis by doing a Doppler of the femorals. It would be more profitable to discuss some of the interesting new developments and controversies in the field. Perhaps the most important development of the last decade has been the introduction of vaso-active agents for intracavernosal use, first discovered in Iraq in 1982. Phentolamine, papaverine and, more recently, prostaglandin are the ones used, singly or together. Their use has simplified our approach to the diagnosis and management of erectile disorders.

In order to refine our diagnostic approach we need to focus on the physiology of erection and perhaps even more so on the patho-physiology.

What is penile erection really?

In the flaccid state we find contracted arterioles with very minor inflow, as well as contracted smooth muscle of the corpora, and free blood eflux of tissues via the subtunical veins which

drain into the emissary and circumflex veins to the deep dorsal veins of the penis. During erection which is dependent on both parasympathetic and sympathetic

For the penis to function, it must relax!

stimuli, you get a tremendous increase in arterial diameter which you can measure with duplex sonography. But this arterial inflow is not the most important factor in erection. Even more important is smooth muscle relaxation, very different from most other body functions. For the penis to function it must relax. This relaxation in turn causes venous restriction. With stimulation, whether in experimental models, or with normal tactile or visual stimuli or with the injection of vaso-active agents, one gets a tremendous increase in arterial inflow. With full tumescence the arterial inflow starts to slow down. This is a vascular phenomenon and is under parasympathetic influence. A rigid erection involves contraction of the ischio-cavernosus muscles under the influence of the sympathetic somatomotor system as well and the veins under the tunica albuginea are tightly compressed so that outflow is prevented and you get intrapenile blood pressures far above the systemic, up to 500 to 600mm of mercury.

In the corpus spongiosum and glans penis it is different as the veins lie just outside the tunica, so that whilst there is some tumescence these parts do not become rigid, and you can express all the blood from the glans even with a rigid erection.

Neurochemistry

Acetylcholine is of course a well-known neuromodulator but there are other important ones involved in the process of erection. *Vasoactive intestinal polypeptide (VIP)* can increase arterial inflow and corporal pressure due to its action on corporal tissue. The last two years have greatly expanded our knowledge of the neurochemistry of erection. *Calcitonin-gene-related-polypeptide (CGRP)* is also a non-cholinergic, non-adrenergic neuromodulator which is able to relax corporal smooth muscle but not to full erection. *Serotonin* and *potassium channel blockers* also do so, not on their own but rather in combination with other neuromodulators. *Substance P* has a role as yet not clearly defined whilst *Substance Y* is one of the neuromodulators which causes detumescence, and may find a use in the management of priapism. *EDRF* or *Endothelial Derived Relaxing Factor*, which has featured prominently in vascular research since about 1985 is perhaps the most interesting of these neuropeptides, and a lot of important work has come from Bob Krane and his Boston co-workers. In the case of the penis it is released by the endothelium of the corporal tissue. In diabetics with severe erectile dysfunction it is markedly decreased or absent and it is now the opinion of most of the prominent researchers that it is this and not autonomic neuropathy which is the dominant factor in the diabetic. EDRF works in conjunction with *nitric oxide* and it would not surprise me if the next few years finds the introduction of the ultimate intracavernosal vasoactive agent consisting of a mixture of EDRF and a substance derived from nitric oxide.

Now, what is the pathomorphology of vascular or organic erectile dysfunction and what are the pathogenetic factors involved? Persson, in 1987, did an interesting study. He looked at his papaverine poor responders and nonresponders, all of whom had had duplex scans, and while they were undergoing penile implants, corporal smooth muscle tissue was examined under electron microscopy. Some of these were patients with neurogenic

Penile erection is a vascular phenomenon under parasympathetic influence

disorders and had normal corporal tissue. Those who had poor response to papaverine showed loss of intracellular connections, loss of endothelial lining in the sinusoidal spaces, ischaemic changes with loss of myosin and loss of the contractile elements. The total nonresponders, most of whom were diabetics, showed complete smooth muscle atrophy and loss of the endothelial lining with missing intracellular connections so that there could be

... Sexual Dysfunction in Male Diabetics

no intercellular transfer. There was also heavy deposition of collagen.

So it seems that erectile dysfunction in diabetic males is based not on venous leakage but on altered relaxation of the cavernosa and should really be termed cavernosal insufficiency. And now it becomes clear why operations designed to cure venous leakage fail.

Tenderness and security are necessary requirements

Further studies have revealed that there are two major risk factors for cavernous insufficiency, this severe cause of erectile disorder, namely diabetes mellitus and lipid dysfunction. Peter Junnemann from Mannheim looked at 105 impotent patients which he divided into 4 groups based on their responses to vasoactive injections (incidentally, a far more logical way of categorising such patients than the usual classifications do):

1. Psychological
2. Neurogenic
3. Vasculogenic and
4. Cavernogenic

Those in groups (1). and (2). responded well to intracavernosal injections, the vasculogenic ones needed large doses to achieve a poor response whilst the last group showed no response to any sized dose. A vast battery of biochemical investigations were done and most of these were similar in all 4 groups. However, when their lipids were examined there were interesting differences. Whilst total cholesterol levels were similar, there were significant differences in LDL and HDL-cholesterol fractions on multivariate analysis, in that both groups (3) and (4) showed abnormalities in these fractions. More significantly, in the cavernosal insufficiency group all had classical Friedrichsen type 2 hyperlipidaemia.

They next tried to see what type of pathomorphological changes were produced by dyslipidaemia. Rabbits make acceptable models for atherosclerosis studies, so Junnemann next took thirty rabbits and gave ten a high lipid diet for three months together with tap water, another ten a high lipid diet together with a thromboxane alpha-2 receptor antagonist (which produced an increase in lecithin, a decrease in LDL and a thirty percent reduction in lipids), and another ten had a normal low lipid diet. After three months corpora cavernosal electron microscopy studies showed that the tap-water high lipid group had the typical changes of cavernous insufficiency whilst the normal diet group had no changes and the ones who had the high lipid diet plus the thromboxane $\alpha 2$ antagonist showed less severe cavernosal insufficiency. The Boston workers showed that rabbits fed on a high lipid diet had total destruction of endothelium and absent penile EDRF.

Two major risk factors are diabetes mellitus and lipid dysfunction

To summarise, whilst some of our sexually dysfunctional males have predominantly psychological aetiology, some have neurogenic impotence and will respond well to vasoactive injection therapy. The largest group though will have cavernosal dysfunction and will need either to use one of the suction devices or undergo penile implant surgery.

We have a tendency to become excessively preoccupied with the physiology of sexuality and to forget that, in human terms, a sexual encounter is a much more complicated phenomenon than mere spinal reflex activity. Tenderness and security provided by the feeling of being loved are necessary requirements for both women and men to respond. It may well be that a more caring relationship in diabetic marriages can counteract any modest or severe physiological deficit.