

PROSTATECTOMY AND SEXUAL FUNCTION

EVA LIBMAN, Ph.D.

CATHERINE S. FICHTEN, Ph.D.

From the Sir Mortimer B. Davis-Jewish General Hospital,
Concordia University, and Dawson College, Montreal, Quebec, Canada

Benign prostatic enlargement occurs almost universally in the male population, typically beginning at age forty years. It has been estimated that by age sixty more than 50 per cent of males experience some kind of prostate problem; this figure increases with advancing age.^{1,2} As the number of males over age fifty-five in the population is increasing, one can expect a growing number of males to manifest symptoms of benign enlargement of the prostate. Surgery is the treatment of choice when symptoms become severe.

All types of surgical procedures commonly disrupt sexual functioning, as does physical illness in general. In many instances, however, there is no identifiable organic cause and the nature of the mediational link between these events appears to be cognitive rather than physiologic.^{3,4} The aging process itself brings qualitative changes to the sexual response, as, indeed, it does to many physical abilities.⁵ However, physiologic aging, illness, and medication side effects do not adequately account for the frequently noted accelerated decline of sexual activity with age.⁶ This phenomenon appears to be related to North American attitudes regarding sexuality, specifically the cultural censure of sexual activity and the opinion held by society in general that sexual activity in older individuals is not desirable.⁷ Within the aging population itself, sexual attitudes, lack of knowledge concerning the effects of aging on sexual response as well as motivational factors have been implicated in the decline of sexual activity with age.^{8,9} Surgery involving the sexual organs may pose a serious hazard to an aging male population already vulnerable to sexual difficulties. In the case of prostatectomy, false beliefs and misinformation concerning the

effects of surgery also may play a substantial role.

Two surgical techniques are commonly used to correct benign prostatic enlargement: transurethral resection (TURP) in the large majority of cases and the retropubic approach for very large glands. In the past, suprapubic prostatectomy was also employed. Radical procedures, commonly perineal or retropubic surgery, are employed when cancer is present. In the past, the outcome of radical prostatectomy has been largely unpredictable.^{10,11} More recently, studies have demonstrated that erectile impairment may be avoided if care is taken not to damage the pelvic nerve plexus.¹²

Transurethral resection is a procedure which involves no external incision and is unlikely to disturb the innervation of the erectile system; therefore, it should not cause organic damage. Nevertheless, the reported adverse sexual consequences of prostatectomy, including the transurethral procedure, have been substantial. When one considers that here we have a situation of an aging individual already exposed to negative societal pressure and undergoing a surgical procedure involving the genitals directly, some incidence of psychogenic postprostatectomy sexual impairment might be expected. What is surprising is the variability of outcome following nonradical procedures. Studies reviewed herein reveal an astonishing range, 0 per cent to 100 per cent, in the frequency with which such impairment occurs after nonradical prostate surgery.

Given the variability of sexual impairment postprostatectomy reported in the literature, it is difficult to make firm conclusions concerning the risks to sexual functioning of prostate surgery. Numerous important questions in this

area remain unanswered. For example, what factors account for variability in both radical and nonradical prostatectomies? Is postprostatectomy sexual impairment related to characteristics of the prostatic problem, the type of surgery, the age or physical well-being of the male, to misconceptions concerning the consequences of prostatectomy, or to the existence of previous sexual difficulty? Or is the variability merely due to methodologic differences in the studies and to differing definitions of "sexual impairment" and "potency"? What really are the consequences of prostate surgery for sexual interest (libido), erectile ability, orgasmic capability, ejaculation, and frequency of sexual activity?

To establish the precise nature of sexual difficulties and concerns after prostatectomy an important first step is to examine the existing literature in a systematic way. A listing of studies done between 1960 and 1985, including information on experimental design, type of surgery, sample characteristics, criteria of sexual functioning and findings, is presented in Tables I, II, and III.

Material and Methods

Studies selected for review were those involving more than one subject and done between 1960 and 1985. Studies are grouped in three tables: within each table, studies are listed in alphabetical order by author.

Nine studies in Table I examine the outcome of various types of nonradical prostatectomies; these studies furnish data on the incidence of sexual impairment post nonradical prostatectomies, provide comparative information on the effects of different procedures, and supply information on risk predictors for sexual dysfunction post prostatectomy.

Table II includes five comparative studies which permit an evaluation of the effects of prostatectomy per se and of surgery in general.

The eight studies in Table III represent a sampling of those which evaluate the consequences of radical prostatectomies. These investigations provide information on factors implicated in sexual dysfunction after surgery for prostatic cancer.

Methodologic concerns

The results of the investigations reviewed raise what can only be accepted as interesting hypotheses because a variety of methodologic weaknesses and confounds makes the results dif-

ficult to interpret. Problems with these studies include: (1) the majority of studies are uncontrolled; (2) many samples are nonhomogeneous with respect to type of prostatic disorder, type of surgery, general physical health, age, and availability of a partner; (3) in many studies data from males who were sexually active prior to surgery are grouped with data from males who were impotent prior to surgery; (4) outcome measures often consist of subjects' responses to some generally phrased interview questions; (5) only two of the studies evaluated provide corroborative data from the female partners; (6) few studies employed standardized, validated self-report measures or physiologic assessment techniques; (7) criteria for sexual functioning differ dramatically from study to study and are generally questionable; (8) there is no standardization of the terms used to describe good and poor sexual functioning; (9) few of the experimental designs included systematic collection of the information prior to surgery; (10) preoperative and postoperative testing times are poorly, if at all, defined; and (11) inferential statistics are rarely used, and the treatment of the data is severely limited in the majority of investigations. Furthermore, within a given report, the number of subjects frequently changes without comment or explanation by the authors.

Results in most of the studies reviewed are presented in terms of the number of males included in the investigation and their sexual status prior to and after prostatectomy. Data from younger and older males as well as from those who were sexually active and inactive prior to surgery were frequently combined in the studies reviewed. Whenever possible, we have regrouped and recalculated these data as percentages in order to make the findings comparable. In addition, we have attempted to distinguish between age categories as well as between males who were and who were not sexually dysfunctional prior to surgery, thereby allowing for the evaluation of the differential effects of various types of prostatectomy on males in these groups.

Measurement and criteria of sexual functioning. The studies vary dramatically in the ways in which they measure sexual function pre- and postsurgery: chart information, interview, questionnaire, and nocturnal penile tumescence (NPT) evaluation via mercury strain gauge or the recently developed Snap-Gauge. None of the studies compared the different

types of self-report techniques. Moreover, in those studies where erectile function was measured both by self-report and NPT there was considerable discrepancy between these two sources of data, yielding both false positives as well as false negatives.^{13,14}

Criteria for good and poor sexual functioning also vary tremendously. Some investigations do not define the criteria for "potency." Of those investigations which do define the criteria, some focus exclusively on erectile ability, others add libido, while yet other studies include orgasm and intercourse frequency in the definition. To complicate matters further, some studies define "potency" exclusively in terms of NPT results.

There is a similar diversity as to the mode in which good and poor functioning is described; outcome is variously reported as: potent, impotent, impaired, slight impairment, severe impairment, difficulties, unchanged, worse, improved, sexually active, and sexually inactive.

In view of the discrepancies and inadequacies in the mode of measurement, in the criteria for good and poor sexual functioning as well as in the variety of modalities in which outcome is reported, it is difficult to make comparisons among investigations or to formulate firm conclusions about the results. What follows, therefore, is a "best guess" at the state of the art.

Nonradical Prostatectomies

Effects of age and presurgery sexual functioning

It can be seen in Tables I and II that age plays a major role in the males' sexual status both before and after prostatectomy. Data from those studies where it was possible to differentiate subjects into age categories show that between 79 and 93 per cent of men aged sixty or less experienced satisfactory sexual functioning prior to surgery.^{10,15-18} For males over sixty, the rate of satisfactory sexual functioning prior to prostatectomy is substantially lower, ranging from 40 to 69 per cent.

Twelve studies examined the effects of prostatectomy on males experiencing good sexual functioning prior to prostatectomy. These indicate that when age is not considered, between 66 and 95 per cent retain potency (N.B., the three most extreme scores on both ends of the scale were excluded from this range).

Only three of the studies provided age data for men who were functioning well prior to sur-

gery. These also suggest that younger men are more likely to retain good functioning than are older males. For example, the mean age of men considered "not impotent" after surgery was sixty-five years while that of "impotent" males was sixty-eight.¹⁸ Similarly, studies by De Backer, Lauwerijns, and Willem¹⁵ and Finkle and Moyers¹⁰ indicate that 72 per cent (range = 58% to 89%) of men under sixty retain good sexual functioning while only 65 per cent (range = 58% to 76%) of men over sixty do so.

Men who were experiencing sexual problems prior to surgery rarely improve after prostatectomy, regardless of age. Improvement rates for these men vary from 0 per cent to 14 per cent.^{10,13,14,17,19,20}

Comparisons among different procedures

There do not appear to be any major differences with respect to postprostatectomy sexual function among transurethral, suprapubic, and retropubic prostatectomies.^{10,16,17,19} For males experiencing good sexual functioning prior to surgery, postoperative potency after these procedures generally varies between 69 and 95 per cent. Perineal prostatectomy, a procedure no longer popular in the treatment of benign prostatic hyperplasia, appears to result in a somewhat higher incidence (range = 66% to 71%) of sexual impairment than do the other approaches.^{10,16,21}

The experience of retrograde ejaculation was evaluated in four studies.¹⁷⁻²⁰ In most samples the incidence of retrograde ejaculation ranges from 50 to 76 per cent. Again, no systematic difference among procedures is evident.

Prostatectomy vs other types of surgery

An important question which remains is: what about the 5 per cent to 34 per cent impairment of sexual function after nonradical prostatectomy in men who were experiencing good sexual function prior to surgery? Is this attributable to prostatectomy per se or to the stresses of undergoing surgery? Investigations which address this issue are given in Table II.

Studies by DeBacker, Lauwrijns, and Willem,¹⁵ Finkle, Finkle, and Finkle,²¹ and Windle and Roberts¹⁸ indicate that in all surgery conditions older males manifest greater sexual impairment after surgery. Since prostatectomy patients tend to be older than nonprostatectomy patients,¹⁵ the age variable confounds the interpretation of results in most of the studies comparing prostatectomy to other types of surgery.

TABLE I. Nonradical prostatectomies

STUDY	EXPERIMENTAL DESIGN	TYPE OF SURGERY	SUBJECTS	SELECTION CRITERIA	CRITERIA OF SEXUAL FUNCTION	TESTING TIMES	RESULTS
HARGREAVE & STEPHENSON	pre-post, 17 comparison of 4 types of prostatectomy	transurethral (n=113), retropubic (n=44), suprapubic (n=43), reconstructive retropubic (n=52)	n=246 males age: 45-84, \bar{x} =67, age < 60 (n=63), age > 60 (n=183), pre-op potent = 55%, age < 60 = 79%, age > 60 = 47%, pre-op impotent = 45%, age < 60 = 21%, age > 60 = 53%	excluded: cancer, impaired mentation	questionnaire: satisfactory erection for intercourse, ejaculation, orgasm, desire for intercourse	prior to hospital discharge, 6 mo. post-op	pre-op fully potent (n=97) post-op: transurethral 93%, suprapubic 93%, retropubic 94%, reconstructive 91%, pre-op partially potent (n=40) transurethral 12%, suprapubic 0%, retropubic 9%, reconstructive 0%, pre-op impotent (n=66) all prostat. 0%, ejaculation (n=90) post-op: full reduced transurethral 44%, suprapubic 31%, retropubic 20%, reconstructive 24% pre-op potent (erections) (n = 187) post-op: transurethral 76%, "open" 71%, pre-op impotent (erections) (n=8) post-op: transurethral 14%, "open" 14% libido (whole sample: pre-op potent + impotent) post-op: same Impair't slight severe transurethral 63% 19% 10% 8% "open" 38% 18% 16% 5% Intercourse frequency (n=138) post-op: same greater lower transurethral 69% 6% 25% "open" 64% 8% 28% ejaculation (n=168) post-op: reduced absent transurethral 27% 73% "open" 0% 100%
HAURI ¹⁹	pre-post, transurethral vs. "open" prostatectomy	transurethral (n=103), "open" (n=92)	n=193 males, age < 65 pre-op potent = 93%	prostatectomy without complications	interview: libido, erection, orgasm/ejaculation, intercourse frequency	1 year or more post-op, pre-op unclear	pre-op potent (erections) (n = 187) post-op: transurethral 76%, "open" 71%, pre-op impotent (erections) (n=8) post-op: transurethral 14%, "open" 14% libido (whole sample: pre-op potent + impotent) post-op: same Impair't slight severe transurethral 63% 19% 10% 8% "open" 38% 18% 16% 5% Intercourse frequency (n=138) post-op: same greater lower transurethral 69% 6% 25% "open" 64% 8% 28% ejaculation (n=168) post-op: reduced absent transurethral 27% 73% "open" 0% 100%
HOLTGREVE & VALK ²²	pre-post comparison of 2 types of prostatectomy	transurethral, perineal	n=382 males, age: \bar{x} =69	pre-op potent, no carcinoma	interview or charts: "satisfactory" sexual functioning	unclear	pre-op potent (whole sample) post-op: all prostatectomies 60% ejaculation (whole sample) post-op: retrograde "almost all" "no age difference between potent & impotent"

TABLE III. Radical prostatectomies

STUDY	EXPERIMENTAL DESIGN	TYPE OF SURGERY	SUBJECTS	SELECTION CRITERIA	CRITERIA OF SEXUAL FUNCTION	TESTING TIMES	RESULTS
CATALONA, N.J. & DRESHER, S.M. 2,4	pre-post	modified radical retropubic prostatectomy	n=42 males age: 41-75, x=62, age < 60 (n=14) age > 60 (n=28)	pre-op potent, prostatic cancer	Interview: male only or male & female; full erection = sufficient for vaginal penetration	pre-op unclear, 4 - 15 months post-op	pre-op potent (whole sample) post-op: $\frac{\text{full erection}}{\text{modified radical}}$ retropubic 52% 45% 2% age age < 60 67% 1 age > 60 43% 1 post-op full erection (n=22) 3 mo. post-op 36% 6 mo. post-op 75% 12 mo. post-op 91% 15 mo. post-op 100%
EGGLESTON & WALSH 2,5	pre-post	modified radical retropubic, n=60	n=60 males, age: 54-72, all had partners	pre-op potent, prostatic cancer, partner available, followed for at least 1 year post-op	Interview: males & females; potency = erection sufficient for vaginal penetration & orgasm	pre-op unspecified, at least 1 year post-op	pre-op potent (whole sample) post op: $\frac{\text{modified radical retropubic}}{\text{pathological stage}}$ intact prostatic capsule 84% periprostatic tissue involvement 47% seminal vesicle involvement 33% lymph node involvement 35%
FINKLE & TAYLOR 11	pre-post	radical prostatectomy	n=12 males, age: x = 58	pre-op potent, most had cancer	chart: "patient is able to have an erection sufficient for intercourse"	within 1 year pre & post-op	pre-op potent (whole sample) post-op: $\frac{\text{potent}}{\text{impotent}}$ radical $\frac{70\%}{50\%}$ age (x) 54 61
LUE, TAKAMURA, SCHMIDT & TANAGHO 2,7	neuro-physiological animal study, "acute" vs. "chronic" preparation, cavernous nerves divided vs. not divided	all animals: total pros-rectomy, abdominal incision, electrodes implanted around cavernous nerves	n=6 dogs	pre-op potent	erection via electro-stimulation	1-60 days post-op	pre-op potent (whole sample) post-op: $\frac{\text{cavernous nerves preserved}}{\text{cavernous nerves divided}}$ $\frac{83\%}{0\%}$

Author	Study Design	Patients	Excluded	Questionnaire	Unclear	Whole Sample (pre-op potency unspecified)
GOLD & HOTCHKISS	pre-post, prostatectomy vs. inguinal herniorrhaphy	n=125 males, age: 41-82; prostatectomy (n=91)	excluded severe post-op complications, cancer, disabling chronic diseases	desire, quality of erection, ejaculation, frequency of intercourse	unclear	post-op: no change worse better prostatectomy age 50-60 80% 10% 10% age 61-70 32% 62% 6% age 71-82 34% 66% 0% herniorrhaphy age unspecified 97% 7 7
		n=18 refs, age: 5 mo.	high level of sexual activity in 5 mating tests pre-op	latency & frequency: mounts, intramissions, ejaculation	3-4 weeks post-op	pre-op: potent (whole sample) post-op: prostatectomy 100% incision 100%
WINDLE & ROBERTS	pre-post, prostatectomy vs. intra-peritoneal vs. inguino-scrotal surgery	n=179 males, age: 40-90; prostatectomy n=119, age < 60 (n=28), age > 60 (n=91) pre-op: potent =75% age < 60=93% age > 60=69% pre-op: impotent =25% age < 60=7% age > 60=31%	pre-op potent: "normal sexual activity prior to surgery"	Interview: erections, ejaculation, sexual function satisfactory	6 mo. to 2 1/2 years post-op, unclear	pre-op: potent (prostat. (n=89), other surgery (n=90)) post-op: impotent not impotent prostatectomy 9% 91% retropubic 14% 86% transurethral 0% 100% suprapubic 6% 94% other surgery age (3) prostatectomy 71 64 retropubic 65 61 transurethral N/A 71 suprapubic 71 63 other surgery both types ejaculation normal retrograde post-op: prostatectomy (n=80) 35% 65% retropubic 40% 60% transurethral 29% 71% suprapubic 99% 1%
		n=45 Intra-peritoneal surgery (n=45) Inguinoscrotal surgery (n=45)	Intra-peritoneal surgery (n=45) Inguinoscrotal surgery (n=45)			

TABLE II. Comparisons with other types of surgery

STUDY	EXPERIMENTAL DESIGN	TYPE OF SURGERY	SUBJECTS	SELECTION CRITERIA	CRITERIA OF SEXUAL FUNCTION	TESTING TIMES	RESULTS
DeBACKER LAUMERLINS & WILLEN ^{1,5}	pre-post, retropublic prostatectomy (n=100), vs. major general surgery vs. major urological surgery	retropublic prostatectomy (n=100), urological surgery (n=100), general surgery (n=100)	n=300 males, age: (35-81+)	consecutive series	Interview: frequency of intercourse, desire for inter- course, erection, ejaculation	data collected 6 mo. post-op at which time retrospective 1 year and 6 mo. pre-op data were obtained	pre-op sexually active (n=224) post-op: 1 yr. pre/6 mo. post 6 mo. pre/6 mo. post
			prostatectomy age: \bar{x} = 66	sexual function series		some improved worse same improved worse	prostatectomy 46% 13% 41% 29% 45% 26%
			age < 60 (n=15)	urological surgery			urological 59% 0% 41% 50% 5% 48%
			age 61-70 (n=29)	general surgery			general 53% 6% 39% 45% 16% 40%
			age > 71 (n=22)	urological surgery			prostatectomy 53% 5% 42% 32% 37% 32%
			sexually active = 69%	urological surgery			age 61-70 49% 11% 40% 23% 51% 26%
			age < 60 = 86%	urological surgery			age 71 53% 27% 40% 40% 40% 20%
			age 61-70 = 80%	urological surgery			urological surgery
			age > 71 = 44%	urological surgery			age 60 75% 0% 25% 68% 2% 50%
			urological surgery	urological surgery			age 61-70 38% 0% 63% 21% 4% 75%
FINKLE & FINKLE ²⁾	pre-post, 3 types of prostatectomy vs. perineal biopsy	prostatectomy: simple perineal (n=32), radical perineal (n=10), subtotal (n=8) perineal biopsy: (n=6)	age: \bar{x} = 59	pre-op potent, series of office patients	Chart: potent = desire + coitus + orgasm at least once during 1 year	1 year pre-op & post-op	pre-op potent (whole sample) post-op: potent
			age < 60 = 50%	pre-op potent, series of office patients			prostatectomy
			age 61-70 = 32%	pre-op potent, series of office patients			simple perineal 66%
			age > 71 = 18%	pre-op potent, series of office patients			radical perineal 60%
			sexually active = 78%	pre-op potent, series of office patients			subtotal 63%
			age < 60 = 88%	pre-op potent, series of office patients			biopsy 83%
			age 61-70 = 75%	pre-op potent, series of office patients			perineal biopsy 76%
			age > 71 = 56%	pre-op potent, series of office patients			age < 60 50%
			general surgery	pre-op potent, series of office patients			age > 60 50%
			age: \bar{x} = 58	pre-op potent, series of office patients			
age < 60 = 55%	pre-op potent, series of office patients						
age 61-70 = 34%	pre-op potent, series of office patients						
age > 71 = 11%	pre-op potent, series of office patients						
sexually active = 77%	pre-op potent, series of office patients						
age < 60 = 85%	pre-op potent, series of office patients						
age 61-70 = 76%	pre-op potent, series of office patients						
age > 71 = 36%	pre-op potent, series of office patients						

FINKLE & MOYERS 10	pre-post comparison of 4 types of prostatectomy	perineal (n=53), suprapubic (n=14), transurethral (n=31), retropublic (n=1)	n=101 males, age: 30-92, age < 60 (n=22), age > 60 (n=79), pre-op potent = 31%, age < 60 = 86%, age > 60 = 40%, pre-op impotent = 49%, age < 60 = 14%, age > 60 = 60%	series of office patients, no exclusion criteria	interview & questionnaire: potency defined as desire + erection sufficient for intercourse + "gratification"	approx. 1 year pre-op & post-op	pre-op potent (n=52) 73% post-op: transurethral 66% suprapubic 75% age < 60 89% age > 60 58% pre-op impotent (n=49) 41% post-op: all prostatectomies
FINKLE & PRIAM 16	pre-post comparison of 3 types of prostatectomy	transurethral (n=32), perineal (n=35), suprapubic (n=35)	n=102 males, 76% married, age: 40-81, age < 60 (n=46), age > 60 (n=56), pre-op potent = 67%, age < 60 = 87%, age > 60 = 50%	sequential records	interview: erection adequate for intercourse & orgasm	unclear	pre-op potent (n=68) 71% post-op: perineal 95% transurethral 86% suprapubic 86% whole sample (pre-op potent + 1 impotent) 91% age < 60 36% age > 60
MADORSKY ASHAWALLA, SCHUSSLER, LYONS & MILLER 13	pre-post transurethral	n=14 males, age: 2-65, pre-op potent NPT = 100%, questionnaire = 86%	pre-op potent according to NPT criteria, no cancer	questionnaire: criteria of potency unclear: NPT: mercury strain gauge	pre-op when recommended for surgery, 4 weeks post-op	pre-op potent (NPT): decrease 38% transurethral 62% pre-op potent (questionnaire) (n=12) 75% post-op (questionnaire): potent 17% transurethral 85% pre-op impotent (questionnaire) (n=2) 100% post-op (questionnaire): impotent transurethral NPT and questionnaire data inconsistent (29%)	
MOLLER-NIELSEN, LUNDHUS, MOLLER-MADSEN, NORGARD, SIMONSEN, HANSEN, & BIRKLER 20	pre-post prostatectomy vs. "minimal" tissue removal	n=81 males, age: 51-82, x=67; 72% married, pre-op sexually active = 72%	excluded: medical & neurological diseases affecting sexuality, drug consumption known to affect sexuality, cancer, randomly assigned to experimental conditions	interview: sexual desire, erectile capacity, orgasm	pre-op unspecified, 6 & 12 mo. post-op	pre-op sexually active (n=58) 69% post-op: "total" 69% "minimal" 69% pre-op sexually inactive (n=23) 100% post-op: all prostatectomies 100% ejaculation (n=40) retrograde 50% "total" 44% "minimal"	
SO, HO, RODENSTAR, & PARSONS 14	pre-post transurethral prostatectomy	n=35 males, age: 53-85, x = 67, pre-op potent NPT = 69%, questionnaire = 75%	randomly selected, no cancer	questionnaire: unspecified; NPT: mercury strain gauge potency index	pre-op unspecified, 4-6 weeks post-op	pre-op potent (NPT) (n=19) 100% post-op: potent 0% NPT 0% pre-op impotent (NPT) (n=11) 100% NPT and questionnaire data inconsistent (54%)	
ZOHAR, MEIROZ, MAOZ, & DURST 21	pre-post, explanation re surgery & sexuality vs. no explanation	n=15 males, age < 70	potent pre-op, married, no serious systemic disease, no cancer	interview: criteria of potency unclear	1 mo. pre-op, 5-6 mo. post-op	pre-op potent (whole sample) 100% post-op: potent 0% explanation 13% 25% no explanation 13% 25% impotent 0% 63%	

MADORSKY, ASHAMALLA, SCHUSSLER, LYONS & MILLER 13	pre-post radical perineal (n=2)	n=2 males, age: unspecified pre-op potent NPT = 100% questionnaire = 100%	pre-op potent according to NPT criteria, cancer	questionnaires: criteria of potency unclear; NPT: mercury strain gauge	pre-op when recommended for surgery, 4 weeks post-op	pre-op potent (whole sample) post-op: decrease 100% increase 0% radical pre-op potent (questionnaire) (whole sample) post-op: potent 100% impaired 0%
WALSH & DONKER 12	post-op radical retropubic	n=31 males, age: 45-68, x=60	pre-op potent, clinical stage B I disease	interview; NPT: stump test; penile blood flow; penile/breathal index; fully potent = erection + penetration + orgasm + normal stump test; partial erection = erection not sufficient for penetration + normal stump test; total impotence = no erection + abnormal stump test	6 months post-op	pre-op potent (whole sample) post-op: potent 16% partial 23% impotent 61% radical age (median) 58 62 64
WALSH, LEPPOR & EGGLESTON 25	post-op modified radical retropubic prostatectomy	n=12 males, age: 44-68, x = 57, 83% had partner	consecutive series, clinical stage B adenocarcinoma of prostate	interview: males' & females' experience of erection; NPT: Snap-Gauge band	2-10 months post-op	whole sample (pre-op potency unspecified) post-op: erections 100% intercourse 50% interview 100% NPT 50% N/A post-op 6 months (n=6): interview 100% 83% NPT and interview data inconsistent (50%)
WALSH & MOSTWIN 26	pre-post, modified radical retropubic prostatectomy vs. radical cystoprostatectomy	n=75 males, prostatectomy (n=64) age: 34-71, (n=11), age: x = 59	pre-op potent, carcinoma present, had sexual partner	interview: males & females; potency = vaginal penetration + orgasm	pre-op unspecified, prostatectomy: post-op 3-12 mo; cystoprostatectomy: post-op 4-24 mo.	pre-op potent (whole sample) post-op: potent prostatectomy 3 mo. post-op 30% 6 mo. post-op 40% 9 mo. post-op 60% 12 mo. post-op 86% cystoprostatectomy post-op: erections various testing times 82% "age related to potency at 3, 6, 9 mo. but not at 12 mo."

At present, it is impossible to make firm conclusions about whether prostatectomy or surgery in general is to blame for postsurgical sexual impairment. For example, three studies involving human subjects suggest that prostatectomy is followed by a greater degree of erectile disorder than other surgical procedures.^{18,21,22} However, none of these studies specifies the age of patients in the nonprostatectomy surgical groups. Two studies (one human, one animal) indicate that prostatectomy and other types of surgery have about equivalent effects on erectile function.^{15,23} The only human study which provided age information¹⁵ indicated not only that prostatectomy patients tended to be older (and less sexually active prior to surgery) than either urologic or general surgery patients, but also suggested that age, type of surgery, and time of presurgery evaluation all affect the nature of the findings.

Radical prostatectomies for prostatic cancer

In those studies evaluating the effects of radical prostatectomy (Table III) one notes that, generally, males undergoing prostatectomy for prostatic cancer are younger than those with benign prostatic enlargement. Nevertheless, age and postsurgery sexual function again are related. Whenever age-related data are presented, it appears that a greater percentage of younger males retain erectile function compared with older males.^{11,12,24}

Prior to 1982, the incidence of sexual impairment after radical prostatectomy was unpredictable.¹¹ The recent landmark work of Walsh and associates^{12,25,26} provides an explanation for the hitherto inconsistent sexual consequences of radical prostatectomies. These investigators not only described the anatomic course of the neural pathways to the corpora cavernosa, but they also developed a new technique for performing radical prostatectomy which avoids injury to the extensive network of nerves supplying the pelvic floor by avoiding injury to the neurovascular bundles. Surgery using the new technique preserves erectile function in the vast majority of cases. What such studies also demonstrate is that after this "nerve-sparing" surgical procedure, the percentage of patients experiencing a return of erectile function increases as the length of the postsurgical period increases.^{24,26} For example, in one of the studies it was found that only 30 per cent of patients were potent three months after surgery, but after twelve months this rose to 86 per cent.²⁶ Data

from the Catalana and Dresner²⁴ study provide comparable figures (36% and 100%, respectively). The neuroanatomic and neurophysiologic findings in human patients are corroborated by the results of animal experiments of Lue *et al.*²⁷

Other factors affecting postprostatectomy sexual functioning

A few studies investigated additional variables such as the stage of carcinoma in patients having prostatectomy for cancer, amount of prostatic tissue removed, and information given to patients prior to surgery. The results of these studies are confusing. For example, while two studies found that postoperative erectile impairment was related to the stage of disease in cancer patients,^{26,28} a third study found no correlation between clinical or pathologic stage and postoperative potency.²⁴ Reported erectile impairment manifested after transurethral prostatectomy was found to be unrelated to the amount of prostatic tissue removed.²⁰ Impairment in sexual functioning after prostatectomy, however, may be related to patients not having received appropriate information and reassurance with respect to the anticipated consequences of prostatectomy on sexual functioning.²⁰ These latter two studies, however, have not been replicated.

Summary and Clinical Implications

With respect to surgery for benign prostatic enlargement the studies reviewed tentatively indicate the following: (1) different types of prostatectomies result in approximately the same sexual casualty rate (between 5% and 34% in men who were functioning well prior to surgery); (2) approximately two thirds of patients experience orgasm with retrograde ejaculation after prostatectomy (type of procedure is unrelated to the incidence of retrograde ejaculation); (3) patients at risk for erectile disorder include those with poor and marginal preoperative sexual functioning; (4) erectile functioning in males who were experiencing difficulties before surgery is rarely improved by prostatectomy; (5) the incidence of sexual dysfunction after prostatectomy increases with increasing age, even in the presence of good presurgery functioning; (6) amount of prostatic tissue removed does not appear to be related to postsurgical sexual functioning; and (7) providing patients with information about the surgery and its

sexual consequences may reduce the rate of postoperative sexual dysfunction.

Whether it is prostatectomy per se or merely the stresses of surgery which cause sexual dysfunction cannot be determined from the existing findings. The results of the few studies which attempt the comparison are confounded by the effects of age as noted earlier.

Furthermore, the possibility exists that coagulation to control bleeding during the transurethral procedure may affect transmurally the neural structures responsible for erection. This possibility is currently being investigated in the laboratory of M. M. Elhilali and M. Hassouna.

But why is age related to poor postprostatectomy potency for males who experienced good sexual functioning prior to surgery? The available data implicate both sociocultural and physiologic mechanisms. For example, attitudes held both by society in general and by older people themselves regarding sexuality in the elderly are generally negative;⁷ such negative attitudes have been shown to be related to poor sexual adjustment.⁸ Physiologically, some recent findings suggest that the stresses of surgery result in decreased testosterone levels.³⁰ Low plasma testosterone has been implicated in prostatic hyperplasia,¹⁷ and greater prostatic hyperplasia has been linked to increased risk of erectile impairment after prostate surgery.¹² Both hormonal and anatomic variables are related to age, suggesting a possible physiologic mechanism underlying the apparent age-related differences in erectile functioning after prostate surgery.

The procedure for radical prostatectomy in the treatment of prostatic cancer has been modified by Walsh and colleagues^{12,25,26} so that the neural structures responsible for erections are preserved; this modified procedure has been shown to reduce the incidence of postradical prostatectomy impotence. Furthermore, the data indicate that in cancer patients postoperative impotence may be related to the stage of the disease and that while three months after surgery there is a considerable rate of impotence, there is substantial recovery of erectile ability within a one-year period. This suggests that it is important to advise patients undergoing the modified radical procedure that recovery of sexual functioning may lag far behind general physical recovery from the surgery.

Implications for future research

The foregoing conclusions are tentative because of the methodologic weaknesses of the

studies reviewed. Future studies should follow certain minimal guidelines for the collection of data and reporting of results. These include: (1) *better specification and grouping of subjects* (age [by decades], erectile functioning prior to surgery, type of prostatectomy, presence of prostatic cancer and of diseases known to affect sexuality [diabetes], and availability of a sexual partner); (2) *criteria of "potency" and "impotence" must be better specified* (while the concept of sexual function is, in a few studies, presented as multidimensional [daytime erectile ability, nocturnal penile tumescence, desire, ejaculation, orgasm, frequency of intercourse], these component dimensions are rarely evaluated separately); (3) *better measures of criteria must be used* (the studies reviewed show a wide variety of means by which information is obtained [questionnaire, interview, hospital charts, and various physiologic measures] and indicate that self-report and physiologic measures yield highly inconsistent results); (4) *time when pre- and postmeasurements are taken must be specified and, where possible, pre-surgery data should be collected before surgery takes place rather than retrospectively* (data in the studies reviewed suggest that impairment is most likely shortly prior to and subsequent to surgery; thus, both pre- and postprostatectomy potency figures from studies which assessed potency less than 6 months before and after the surgery are likely to be lower, thereby, affecting the nature of the findings).

Who is evaluated, how the assessment is done, what is evaluated, and when this is done have already been identified as important variables to consider in sex therapy outcome studies.³¹ These who, how, what, and when factors clearly are applicable to prostatectomy outcome studies as well. Studies comparing prostate surgery with other types of surgery which use populations that are matched on the grouping variables noted previously are vital to establish whether prostatectomy specifically or surgery in general is to blame for postprostatectomy sexual dysfunction. Answers to the puzzling question of why the high incidence of sexual difficulties postprostatectomy for benign prostatic enlargement in older men who experienced good sexual functioning prior to surgery must also be found. Both the sociocultural and physiologic explanations deserve attention from researchers. Prevention of postprostatectomy sexual difficulties is an important concern. Before effective intervention programs can be

developed, however, well-designed studies are necessary to provide definitive information about the sexual casualty rate after prostate surgery, the precise nature of sexual deficits, and the characteristics of the population at risk.

Sexual Dysfunction Service, 4NE
Sir Mortimer B. Davis Jewish General Hospital
3755 Cote Ste. Catherine Road
Montreal, Quebec H3T 1E2, Canada
(DR. LIBMAN)

ACKNOWLEDGMENT. To Dr. Brahm Hyams for his helpful comments and critical reading of this manuscript.

References

1. Basso A: The prostate: the elderly male, *Hosp Pract*, Oct p 117 (1977).
2. Mostofi FK: Benign hyperplasia of the prostate gland, in: Campbell MF, and Harrison JH (Eds): *Urology*, Philadelphia, WB Saunders Co, 1970.
3. Masters WH, and Johnson VE: *Human Sexual Inadequacy*, Boston, Little Brown, 1970.
4. Thurer S, and Thurer RL: The sexual adjustment of coronary bypass surgery patients: 4-year follow-up, *Rehab Counsel Bull* 27: 108 (1983).
5. Schover LR: *Prime Time: Sexual Health For Men Over Fifty*, New York, Holt, Rinehart and Winston, 1984.
6. Harman SM: Clinical aspects of aging of the male reproductive system, in Schneider EL (Ed): *Aging: Vol. 4, The aging reproductive system*, New York, Raven Press, 1978, pp 29-58.
7. Winn RC, and Newton N: Sexuality in aging: a study of 106 cultures, *Arch Sex Behav* 11: 283 (1982).
8. Martin CE: Factors affecting sexual functioning in 60-79 year old married males, *ibid* 10: 399 (1981).
9. White CB: Sexual interest, attitudes, knowledge, and sexual history in relation to sexual behavior in the institutionalized aged, *ibid* 11: 11 (1982).
10. Finkle AL, and Moyers TG: Sexual potency in aging males: VI. Status of private patients before and after prostatectomy, *J Urol* 84: 1952 (1960).
11. Finkle AL, and Taylor SP: Sexual potency after radical prostatectomy, *ibid* 125: 350 (1981).
12. Walsh PC, and Donker PJ: Impotence following radical prostatectomy: insight into etiology and prevention, *ibid* 128: 492 (1982).
13. Madorsky ML, *et al*: Post-prostatectomy impotence, *ibid* 115: 401 (1976).
14. So EP, Ho PC, Bodenstab W, and Parsons CL: Erectile impotence associated with transurethral prostatectomy, *Urology* 19: 259 (1982).
15. DeBacker E, Lauwerijns A, and Willem C: Sexual behaviour after prostatectomy, *Eur Urol* 3: 295 (1977).
16. Finkle AL, and Prian DV: Sexual potency in elderly men before and after prostatectomy, *JAMA* 196: 139 (1966).
17. Hargreave TB, and Stephenson TP: Potency and prostatectomy, *Br J Urol* 49: 683 (1977).
18. Windle R, and Roberts JBM: Ejaculatory function after prostatectomy, *Proc R Soc Med* 67: 1160 (1974).
19. Hauri D: Life after prostatectomy, *Urol Int* 37: 271 (1982).
20. Moller-Nielsen C, *et al*: Sexual life following "minimal" and "total" transurethral prostatic resection, *ibid* 40: 3 (1985).
21. Finkle JE, Finkle PS, and Finkle AC: Encouraging preservation of sexual function post-prostatectomy, *Urology* 6: 697 (1975).
22. Gold FM, and Hotchkiss RS: Sexual potency following simple prostatectomy, *NY State J Med* 69: 2987 (1969).
23. Tisell LE, and Larsson K: Unimpaired sexual behavior of male rats after complete removal of the prostate and seminal vesicles, *Invest Urol* 16: 274 (1979).
24. Catalona WJ, and Dresner SM: Nerve-sparing radical prostatectomy: extraprostatic tumour extension and preservation of erectile function, *J Urol* 134: 1149 (1985).
25. Walsh PC, Lepor H, and Eggleston JC: Radical prostatectomy with preservation of sexual function: anatomical and pathological considerations, *Prostate* 4: 473 (1983).
26. Walsh PC, and Mostwin JL: Radical prostatectomy and cystoprostatectomy with preservation of potency: results using a new nerve-sparing technique, *Br J Urol* 56: 694 (1984).
27. Lue TF, Takamura T, Schmidt RA, and Tanagho EA: Potential preservation of potency after radical prostatectomy, *Invest Urol* 22: 165 (1983).
28. Eggleston JC, and Walsh PC: Radical prostatectomy with preservation of sexual function: pathological findings in the first 100 cases, *J Urol* 134: 1146 (1985).
29. Zohar J, Meiroz D, Maoz B, and Durst N: Factors influencing sexual activity after prostatectomy: a prospective study, *ibid* 116: 332 (1976).
30. McGrady AV: Effects of psychological stress on male reproduction: a review, *Arch Androl* 13: 1 (1984).
31. Fichten CS, Libman E, and Brender W: Measurement of therapy outcome and maintenance of gains in the behavioral treatment of secondary orgasmic dysfunction, *J Sex Marital Ther* 12: 22 (1986).
32. Holtgrewe HL, and Valk WL: Late results of transurethral prostatectomy, *J Urol* 92: 51 (1964).