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Transurethral Incision of the Prostate and Bladder Neck

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ABSTRACT: Transurethral incision of the prostate (TUIP) is compared to transurethral resection of the prostate (TURP) by reviewing nonrandomized, matched, and randomized studies. These studies indicate that incision of the prostate and bladder neck relieves outflow urinary obstruction, as does TURP. The incision is relatively easier to learn and perform, and requires shorter operative time compared to TURP. The incidence of retrograde ejaculation is lower after incision than after TURP—16% versus 63%, on average. Transurethral incision of the prostate has a potential for reduced costs due to reduced operative time, shortened hospital stay, and the potential for local anesthesia.

Key words: Prostatism, prostatic hyperplasia, bladder neck incision, retrograde ejaculation.

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Historical Background

Transurethral surgery of the prostate and bladder neck is an old operation for relieving the symptoms of bladder outlet obstruction due to benign prostatic hyperplasia (BPH) and/or bladder neck obstruction. In 1575, Paré reported the treatment of carnosities of the urethra using a metal sound (Fig 1) (Shelley, 1969). In 1806, William Blizard used a double gorget, or knife, and introduced the incision of the prostate through a perineal urethrotomy. Due to infection, bleeding, incontinence, and operative mortality, this procedure never became widely accepted, though Guthrie refined it in 1834 (Nation, 1976).

Three major discoveries, however, were to be made before progress in endoscopic surgery was accomplished: development of the lamp by Edison in 1879, discovery of high-frequency current by Hertz in 1888, and construction of endoscopic instruments, such as the punch, by Young in 1909 (Young, 1913). In 1920, Chaulhin presented the first modification of Young's punch by using a current-heated cutting edge on the knife. Bumpus, in 1926, used a cold punch and cut a fenestrum in the cystoscope sheath, and, in 1926, Stern introduced the resectoscope (Bumpus, 1926; Stern, 1926).

Keitzer was the first to introduce endoscopic incision of the bladder neck and prostate. He constructed a small, cold-cutting knife to fit the universal resectoscope, which made incision of the bladder neck under direct vision possible. In 1961 and 1969, Keitzer published papers on transurethral incision of the bladder neck for contracture (Keitzer et al, 1961; Keitzer et al, 1969). Orandi published his first paper on transurethral incision of the prostate (TUIP) in 1973 (Orandi, 1973). At the same time, Shafik introduced an open incision technique for the bladder neck, in which the neck was exposed retropubically and incisions in the adventitia and muscle were made until the mucosa became visible (Shafik, 1973).

Today, TUIP is a widely accepted method for the treatment of infravesical obstruction.

Indications for Transurethral Prostatic Incision

Indications for incision and resection of the prostate are nearly equal, and include urinary retention, recurrent urinary tract infections, azotemia, and symptoms of infravesical obstruction due to BPH, both obstructive (ie, weak stream, abdominal straining, hesitancy, intermittency, incomplete bladder emptying, and terminal dripping), as well as irritative (ie, frequency, nocturia, and urgency). Transurethral resection of the prostate (TURP) would, however, be preferable to incision in patients with BPH and prostates larger than 20 or 30 g, as well as in patients with recurrent gross hematuria due to BPH. With respect to prostatitis, when the aim is to remove the infected prostatic tissue, TURP would be preferred. Incision is preferred for younger men, due to the lower incidence of retrograde ejaculation, which is discussed in detail later in this paper.

Urodynamic studies, including uroflowmetry and pressure-flow studies, are performed mostly to confirm the need for transurethral surgery of the prostate. Flow studies do not differentiate between resection and incision as the preferred treatment.

Technique of TUIP

The incision can be performed unilaterally or bilaterally and at a variety of locations around the bladder neck (Table 1).

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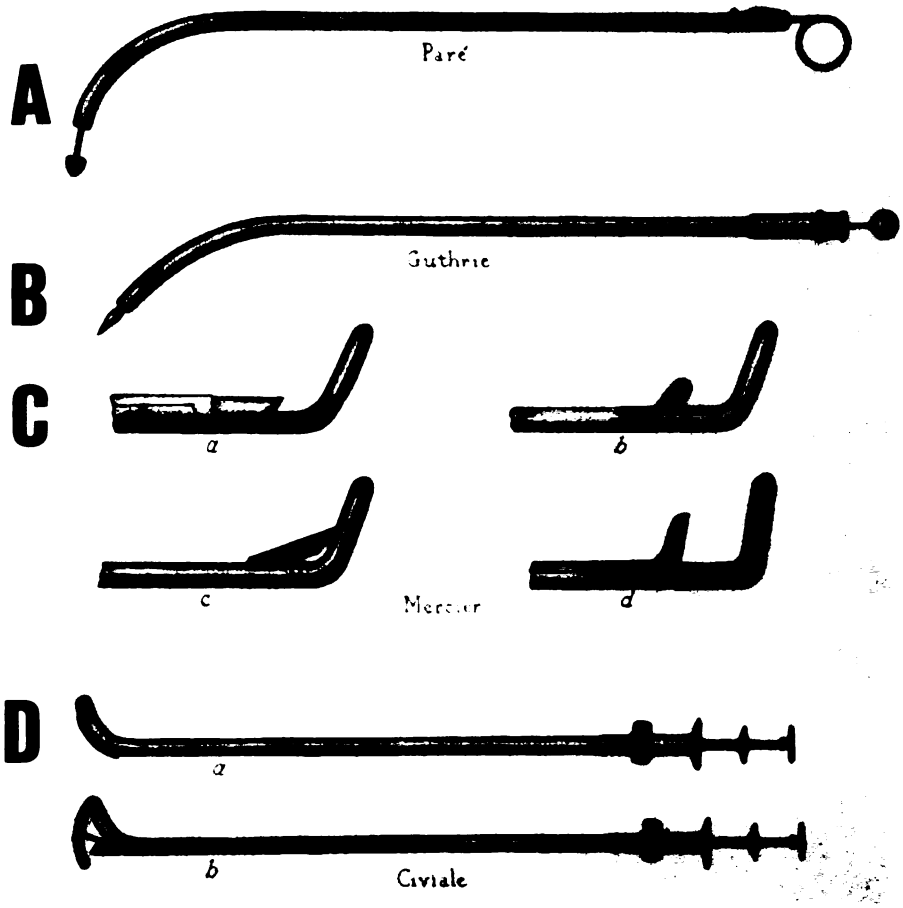

FIG. 1. Early instruments used in transurethral surgery for the relief of infravesical obstruction. (A) Paré's instrument used in 1575 to treat carnosities of the urethra. (B) Guthrie's instrument for cutting in 1834. (C) Mercier's instruments: a. combined prostatic excisor and incisor, 1839–1841, b. incisor, 1844, c. incisor, 1847, d. excisor, 1850. (D) Civiale's instrument: a. closed, b. open.

A number of different instruments have been used, including Colling's, Orandi's, and Sach's knife, as well as the standard resectoscope, and recently the neodymium–yttrium aluminum garnet (Nd:YAG) laser, either to make straight incisions or to perform the TUIP procedure.

The incision is performed primarily through the muscle of the bladder neck, and, in most cases, deepened through the prostatic adenoma (transitional zone) and down to and through the prostatic capsule to release the tissue. Following the incision, the bladder neck usually springs apart. With a deep incision through the capsule, there is a risk of significant bleeding following TUIP, and when performing

Table 1. *Location of incision*

	Unilateral	Bilateral	Both
Position of incision	12, 10, 8, 6, 5, or 7 o'clock	4 and 8, 9 and 3, 4 or 5 and 7 or 8, 5 and 7 o'clock	4 and/or 8, 5 and/or 7 o'clock
Reference	Jenkins 1978		
	Moisey 1982	Orandi 1973, 1987	Hedlund 1985
	Edwards 1982, 1985	Turner-Warwick 1973	Hellstrom 1986
	Graversen 1987	Andersen 1980	
	Dorflinger 1987	Delaere 1983	
	Mobb 1988	Christensen 1985	
	Nielsen 1988	Li 1987	
	Kelly 1989	Loughlin 1987	
	Waymont 1989		
	Bruskewitz 1990		
	D'Ancona 1990		
	Katz 1990		

the incision at the 6 o'clock position, there is a risk of rectal injury. Such complications are rarely reported or encountered.

The 5 and 7 o'clock position is preferred by Orandi. He starts just below the ureteral orifices, and extends distally through the bladder neck to the area lateral to the verumontanum. He originally theorized that this had the advantage of causing atrophy by compromising the blood supply to the median portion of the gland between incisions. More recently, he has indicated that this does not occur. On the other hand, when performing TURP, one intends not to disrupt the capsule to any significant degree.

Results

Comparisons between different incision studies are often limited by a failure to objectify the patient's subjective symptoms through use of a symptom score scheme both before and after the operation. Studies also vary in design, surgical technique, and patient selection. Use of a scoring scheme as proposed by Madsen (Madsen and Iversen, 1983) or an alternative system would minimize some of the uncertainty about subjective symptoms. These studies also do not use the same parameters for describing the assessment of the outcome of the procedure. Some studies describe improvement in irritative as well as obstructive symptoms after incision of the prostate, whereas others state the outcome of the operation in terms of good, fair, and poor, or better, same, and worse.

When evaluating the results of transurethral surgery for BPH, one has to keep in mind that more than 30% of men with untreated BPH will experience improvement in subjective symptoms, and more than 20% will show improvement in objective criteria when followed over a 2.6- to 5-year period (Isaacs, 1990). For this reason, the best studies of TUIP are those that compare the procedure to other procedures by randomizing patients to one or the other. Such randomization addresses the potential bias in assigning a patient to one surgical treatment or another. To look at the effect of natural history, one would need to randomize patients between TUIP and no treatment or a sham operation, but we are not aware of any such studies.

Table 2 lists the peak flow rates, both preoperatively and postoperatively, for patients undergoing TUIP and TURP for BPH, and incision for functional bladder neck obstruction. The mean peak preoperative flow for all groups is

Table 2. *Comparison of peak flow (milliliters per second) following TUIP and TURP for BPH and following incision for functional bladder neck obstruction*

	TUIP				TURP			
Reference	Preoperation	Postoperation	N	Length of follow-up (mo)	Preoperation	Postoperation	N	Length of follow-up (mo)
Edwards 1982	6.8	15	22	1.5–3	6.8	19	22	1.5–3
Hedlund 1985	8.6	24.8–20.8	61–56	3–12				
Hellstrom 1986	8.6	12.9	11	6	7.5	16.5	13	6
Larsen* 1987	7.4	14.4–18.5	15–11	3–12	8.6	16.3–20.6	16–10	3–12
Orandi 1987	8.2	13.7	42	3	7.6	12.7	39	3
Dørflinger* 1987	10.0	15	17	3	9	19	21	3
Graversen 1987	7.9	16.5	18	3				
Mobb 1988	10.0	18.15	64	2–3				
Nielsen* 1988	5.0	10–9	24	2–12	5	17–12	25–23	2–12
Kelly 1989	6.8		26	6–34				
Katz 1990	7.4	17.0	66	1.5–12				
D'Ancona 1990	5	11	27	3	6.7	13.8	22	3
Bruskewitz 1990	7.1	12.7	29	3	9	17.2	32	3
Christensen* 1990	7.8	12.7–13.5	35–31–23	3–12	9.7	16.6–18.5	34–22	3–12
Mean	~8	~15			~8	~16		
INCISION								
Andersen† 1980	10.2	20.9–18.6	28	≤4				
Delaere‡ 1983	7.1	17.3	32	3				
Moisey§ 1982	8.4	22.9	38	2				
Christensen¶ 1985	9	23	126–123	3				
Mean	~9	~21						

* Randomized studies.
† Mean age 51 yr; range 22–67 yr.
‡ Mean age 60 yr; range 32–84 yr.
§ Mean age not stated; range 33–81 yr.
¶ Mean age 53 yr; range 28–74 yr.

approximately 8 ml/second, and increases postoperatively to approximately 15 ml/second for the TUIP and TURP group, and 21 ml/second for the functional bladder neck obstruction group. Table 3 compares subjective improvement in the various studies of incision of the prostate and bladder neck and TURP. The incidence of retrograde ejaculation after incision and resection is listed in Table 4.

TURP as the Standard Procedure

As indicated, evaluation of TUIP requires a standard for comparison. However, TURP is underreported, causing difficulties in comparison. In general, TURP studies indicate that the procedure is successful in 85% to 90% of patients, with more than 90% of patients doing well within the first 4 months after surgery (Mebust, 1988). Ball has found that 78% of TURP patients are better 5 years after surgery (Ball and Smith, 1986). Mebust, in a review of 3,885 TURPs, reported a median resected weight of approximately 22 g of tissue (Mebust et al, 1989). In 65% of the TURPs, less than 20 g was resected. According to these data, most surgically treated cases would be eligible for TUIP if the procedure was aimed at patients who were expected to have a resected weight of less than 20 g. Bladder neck contractures are seen more frequently when TURPs are performed in prostates with resected weights of less than 20 g. The incidence of perioperative bleeding and fluid absorption is significantly higher during transurethral resections lasting more than 90 minutes (Mebust et al, 1989). Mebust points out that the greatest morbidity is found in patients who present with acute urinary retention, have a gland larger than 45 g, and a resection time of longer than 90 minutes.

TUIP in Matched Studies

Transurethral incision of the prostate has been compared to TURP in nonrandomized matched studies. In these studies, patients who seem to have similar preoperative characteristics are identified retrospectively from the same institution and compared. Orandi compared TUIP to TURP in 132 matched cases (Orandi, 1987). Patients with small prostates and short prostatic urethras were treated with TUIP and compared to TURP patients with similar glands. Global subjective results after 3 months revealed a good result in 94% of TUIP patients versus 88% of TURP patients. After 1 to 3 years, TUIP bettered TURP in subjective results, 88% to 66%. Orandi, however, found no statistically significant difference in subjective symptoms or uroflowmetry in the two groups, except for a higher incidence of bladder neck contracture after TURP.

Edwards, as well as Orandi, states that the incision as a sole procedure should be reserved for small glands, because the procedure is difficult to do correctly and associated with increased complications in large glands (Orandi, 1987; Edwards, 1989). Although TUIP is not applicable for larger glands, it substantially reduces operative time, and is applicable for patients in acute urinary retention. It thereby addresses several issues concerning perioperative morbidity. However, symptom relief is less often seen when large glands are incised.

Table 3. *Percent change in global assessment following TUIP and TURP for BPH, and incision for functional bladder neck obstruction (follow-up lasted for 3 months, unless otherwise indicated)*

	TUIP				TURP			
Reference	Better	No change	Worse	N	Better	No change	Worse	N
Hellstrom 1986	91	Same + worse = 9		11	100			13
Orandi 1987	94	Fair 4	Poor 2	66	88	Fair 6	Poor 6	66
Larsen*† 1987	95	5		19	94	6		18
Graversen† 1987	87	9	4	23				
Dørflinger*† 1987	93	7		17	95	5		21
Kelly†‡ 1989	Statistically significant improvement			26				
Waymont 1989	87	11	2	133				
Katz†§ 1990	Statistically significant improvement			66				
Christensen*† 1990	81	Same + worse = 19		35	95	Same + worse = 5		38
Bruskewitz† 1990	83	Same + worse = 17		67	93	Same + worse = 7		67
INCISION								
Jonas 1979	76	23	1	100				
Andersen 1980	93	7	0	28				
Moisey 1982	87	3	10	38				
Delaere 1983	81	19	0	32				
Christensen 1985	90	8	2	28				

* Randomized studies.
† Symptom score used.
‡ Follow-up 6–34 mo.
§ Follow-up 1.5–64 mo.

Table 4. *Comparison of retrograde ejaculation after TUIP and TURP*

	TUIP			TURP		
Reference	%	N	Follow-up	%	N	Follow-up
BPH						
Orandi 1973	NR					
Windle 1974				51	49	6 mo–2.5 yr
Turner-Warwick 1979	15*	NR	NR			
	5†	NR	NR			
Edwards 1982	20	20	3 mo	100	21	3 mo
Orandi 1985	47	114	3 mo–15 yr			
Hedlund 1985	5	61	6 mo			
Hellstrom 1986	0	7	6 mo	62	13	6 mo
Dørflinger‡ 1987	0	17	3 mo	45	21	3 mo
Larsen‡ 1987	28	9	3–12 mo	100	8	3–12 mo
Orandi 1987	31	17	1.5–36 mo	25	12	1.5–36 mo
Mobb 1988	15	40	2–3 mo			
Kelly 1989	45	11	6–34 mo			
Christensen‡ 1990	13	23	3–48 mo	37	19	3–48 mo
D'Ancona 1990	0	22	3 mo	63	19	3 mo
Katz 1990	17	42	1.5–64 mo			
Mean	~17			~63		
Functional bladder neck obstruction		INCISION				
Keitzer 1961	NR					
Keitzer 1969	NR					
Jonas 1979	7	100	3–24			
Andersen 1980	0	28	50			
Moisey 1982	16	26	2–24			
Delaere 1983	37	11	6–44			
Christensen 1985	22	27	3			
Mean	~16					

NR = not reported.
* Bilateral.
† Unilateral.
‡ Randomized studies.

Randomized Trials of TUIP

Randomized trials are preferred, as they give a better measure of comparison than historic controls of matched studies. Horan randomized patients to balloon dilatation or incision of the prostate, and showed that voiding symptoms in all patients in the incision group were improved, compared to 66% in the balloon dilatation group (follow-up not stated; Horan et al, 1990).

Li and Ng (1987), Larsen et al (1987), Dørflinger et al (1987), Nielsen (1988), and Christensen et al (1990) have authored papers on studies that randomized patients to either TUIP or TURP. These studies indicate that incision of the prostate and bladder neck relieves outflow obstruction, as does TURP. The peak flow of the TUIP group is slightly lower than that of the TURP group after surgery, and symptom relief is possibly a little better in the TURP group, but these statements are based on only four and three trials, respectively. The incidence of retrograde ejaculation in the randomized studies parallels the results listed in Table 4.

Compared to TURP, the incision is relatively simple to perform and teach, and of short operative duration, thus minimizing the fluid absorption that is problematic with TURP (Li and Ng, 1987). Nielsen described significantly shorter operative time in the incision group compared to the TURP group (Nielsen 1988). Li and Ng confirmed that the operative time for TUIP is about half that required for resection, but this difference was not statistically significant in their small study (Li and Ng, 1987). Dørflinger found that operative time and blood loss during surgery was significantly less in the TUIP group compared to TURP (Dørflinger et al, 1987). Reduced operative time may decrease pulmonary and cardiovascular complications after surgery.

Potential for Reduced Cost

Edwards, and Li and Ng state that the postoperative stay for TUIP is about 2 days shorter than that for TURP (Edwards, 1989; Li and Ng, 1987). In addition, the incision can be performed more easily under local anesthesia (Loughlin et al, 1987; Graversen et al, 1987). Reduced operative time,

decreased perioperative morbidity, shortened hospital stay, and the potential for local anesthesia are all cost-saving advantages.

Retrograde Ejaculation

The percent of patients experiencing retrograde ejaculation after incision and resection of the prostate is listed in Table 4. The number of sexually active men are listed by "n" where this was possible to determine when reading the results of each investigation. Turner-Warwick found a 10% difference in ejaculation between patients undergoing bilateral and unilateral incision of the prostate, in favor of the unilateral incision (Turner-Warwick, 1979). Hedlund and Ek, however, found the same incidence of retrograde ejaculation in the two groups (Hedlund and Ek, 1985). There seems to be a great difference between the TUIP versus the TURP group, 16% versus 63% on average, but no difference was seen after incision for BPH versus functional bladder neck obstruction (Table 4). According to the reported age range of this latter group, one would expect that the bladder outlet obstruction in some elderly men was due to BPH as well as functional bladder neck obstruction.

Hedlund and Ek state that adequate ejaculation is due to contraction of the proximal urethra, and stop their incision proximal to the verumontanum (Hedlund and Ek, 1985). Edwards believes that transection of the seminal vesicles causes retrograde ejaculation. Not entering the seminal vesicles during incision lowered the incidence of retrograde ejaculation (Edwards, 1989). Bolt et al, in two age-matched groups—one undergoing TURP and the other undergoing general surgery—found that TURP has a negative impact on potency (Bolt et al, 1986). To our knowledge, there have been no reports of impotence in men who have undergone TUIP.

Bladder Neck Contracture

Whereas bladder neck contracture is seen in approximately 8% of patients after TURP performed in smaller glands, this is seldom seen after incision of the prostate (Sikafi et al, 1985; Mebust, 1987; Orandi, 1990). Vesical neck contracture following TURP is generally treated with a bladder neck incision (Sikafi et al, 1985). Performing prophylactic bladder neck incision for TURP in glands of less than 20 g in conjunction with TURP reduces the incidence of bladder neck contracture to about 1% (Kulb et al, 1987). Transurethral incision of the prostate substantially reduces the incidence of postoperative bladder neck contraction.

Prostate Cancer Risk

A disadvantage of the incision technique is the potential for missing stage A1 or A2 prostatic cancer. As a compromise, a resectoscope loop can be used to perform the "incision," or a simultaneous needle biopsy to obtain tissue can be performed. Histologic examination of prostatic tissue following TURP reveals that prostatic carcinoma is found unexpectedly in 10% of the patients, with around 7% of these comprising stage A1, most of whom do not have a clinical recurrence of cancer. Stage A2 comprises the remainder, and some of these patients are assigned to further treatment. In an elderly population, a missed diagnosis of Stage A cancer might be of minor importance, but in the rest of the patient population, this could lead to reduced chances of survival. Prostate-specific antigen (PSA) and transurethral ultrasonography can be used to increase the chances of the early detection of prostatic cancer, but until now neither of these screening methods, or digital rectal examination, have been shown to clearly decrease mortality (Chodak, 1989).

Laser Incision

Little peer-reviewed material is published on laser treatment of the human prostate, and often the follow-up time is too brief to draw firm conclusions about this new technique. Recently, a transurethral ultrasound-guided laser was introduced, as well as a hot cautery wire mounted on a balloon catheter. Bloiso treated 36 patients for secondary bladder neck contractures using an Nd:YAG laser and all patients evaluated (n = 29) responded well at an average follow-up time of 7 months (Bloiso et al, 1988). Six patients suffering from BPH were treated with photoirradiation; results were good in five patients and fair in one at average follow-up of 6 months. None of the patients experienced retrograde ejaculation after surgery.

Conclusion

In conclusion, TUIP relieves urinary outflow obstruction due to BPH, as does TURP. The incision, however, should be performed only in men with glands of an estimated resected weight of less than 20 g, because of a poorer postoperative outcome and an increased complication rate when the procedure is performed in men with larger glands. The incision technique should be performed in younger and/or sexually active men, because the incidence of retrograde ejaculation is approximately 40% to 50% lower than that found after TURP. The incision technique is relatively easy

to learn and perform, requires a shorter operative time, and causes less blood loss during surgery compared to TURP. Because of reduced operative time, decreased perioperative morbidity, and a shortened hospital stay, TUIP has the potential for reduced costs. Since local anesthesia can be used, treatment of patients on an outpatient basis is possible. A disadvantage of the incision technique is the possibility of missing stage A prostatic cancer. This could be overcome to some extent by using the resectoscope loop to perform the "incision," or by doing a simultaneous needle biopsy to obtain tissue for histologic examination.

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