measured the dynamic pressure of the jet stream with different resectoscopes, pressure heads and valve positions, obtained dynamic pressure readings of negligible magnitude (less than 1 cm of water). This was confirmed *in vivo*.³

Intravenous absorption occurs if the static pressure exceeds the pressure in the opened veins of the prostatic fossa. The critical static pressure at which fluid is absorbed varies with the position of the patient. In the Trendelenburg (20°) position it is 0.25 kPa increasing to 1.25 kPa in the horizontal and 1.75 kPa in the head up position (20°).³ The height of the reservoir bag thus becomes irrelevant as long as one is within the static pressure limits. Extravascular absorption may occur at even lower bladder pressures.⁴

(3) Monitoring serum sodium concentration to detect irrigant absorption is invasive and does not give real time absorption values of irrigant fluid. Hultén *et al.* described a simple, non-invasive, sensitive, repeatable method⁵ which involves tagging irrigating fluids with 1% ethanol and monitoring the expired breath ethanol concentrations using a hand-held breathalyser type of device. The technique has been used regularly in patients undergoing TURP under spinal, epidural and general anaesthesia.^{5,6} With this method absorption of as little as 150 ml · 10 min⁻¹ can be instantly detected.

(4) Finally, Dr. Jensen advocated spinal anaesthesia to enable early detection of cerebral symptoms during TURP. Waiting for the onset of cerebral symptoms to diagnose and treat TURP syndrome is like shutting the barn door after the horse has bolted. The TURP syndrome can be prevented by careful monitoring of the absorption events as they occur and by taking prompt steps to minimize absorption such as reducing the static pressure in the bladder to below intravascular pressure and securing haemostasis.

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REPLY

My recommendations for prevention of the TURP syndrome were intended only as general guidelines. I am happy that further discussion of this topic has been stimulated.

(1) A recent series of 3,885 patients undergoing transurethral prostatectomy was reported by Mebust. He concluded that the TURP syndrome occurred in two percent of patients when the resection time was more than 90 min but in only 0.7% when the resection time was less than 90 min.¹ A recent review suggested that the resection time be limited to 60 min.² The TURP syndrome has occurred as early as after only 15 min of resection time.³

(2) It has been suggested that the maximum allowable pressure of the irrigating fluid should be 6.9 kPa (70 cm H₂O), to minimize intravascular absorption.² Intravascular absorption occurs when the pressure in the prostatic fossa exceeds the pressure in the pelvic veins, concomitantly with an opening in the pelvic veins. Madsen concluded that absorption was lower when the irrigating fluid was maintained at 5.9 kPa (60 cm H₂O) over the table than when the fluid height was maintained at 6.9 kPa (70 cm H₂O) and 8.8 kPa (90 cm H₂O).⁴ Hahn determined that the intravesicular pressure could vary greatly in different patients even though the irrigating bag was maintained at the same height above the prostatic fossa.⁵ He suggested that other factors such as the operating technique of the surgeon and the elastic properties of the bladder were more dominant factors in determining the intravesicular pressure than the height of the irrigating bag.⁵ Hultén concluded that the dynamic pressure of the irrigating jet is smaller than the static pressure within the bladder.⁶ However, the dynamic pressure is important when the flow rate through the instrument is high and also when flow declines.⁶

(3) Tagging the irrigating fluid with ethanol and monitoring the expired breath ethanol concentration has been described as a noninvasive technique to detect absorption instantly.⁷ The rise in expired ethanol occurs immediately after intravascular absorption.⁷ Sampling the expired ethanol is an intermittent technique, therefore absorption might be missed if sampling is not performed simultaneously with the absorption. The technique will follow intravascular absorption but does not detect extravascular absorption as readily.⁸ Patients with an elevated serum creatinine concentration have a higher expired ethanol concentration than those with normal renal function.⁸ The irrigating fluid containing 1.5% glycine and 2% ethanol in water has a high osmolality of 650 mosmol · kg⁻¹ and the solution of 1.5% glycine and 1% ethanol is still hyperosmolar.⁸

Patients with an expired ethanol concentration of more than 0.6% smelled of alcohol and displayed an altered affect which was attributed to ethanol absorption.⁸ Two series have been reported in which the irrigating fluid was tagged with two percent ethanol.^{7,8} Regional anaesthesia was used in these series, and therefore the patients were able to cooperate with the sampling technique. I look forward to reading D. Hultén's series in which general anaesthesia and one percent ethanol were used.

(4) I agree completely with Dr. Sarma and Dr. Hultén that prevention of the TURP syndrome is more desirable than treatment after it has occurred. Continuous monitoring of bladder pressure and maintaining this pressure at a safe level would reduce the morbidity of the surgical procedure. Anaesthetists are in a position to suggest these precautions; our surgical colleagues should modify their practices accordingly.

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