348

Ord J. [1], Lunn D. [2], Reynard J. [1]
1. National Spinal Injuries Centre, Stoke Mandeville Hospital, 2. University Department of Statistics, Oxford

BLADDER MANAGEMENT AND RISK OF BLADDER STONE FORMATION IN SPINAL CORD INJURED PATIENTS

Aims of Study

The relative risk of bladder stone formation in spinal cord injured patients managed with intermittent self catheterisation, indwelling catheters and condom drainage (with or without prior sphincterotomy), remains uncertain. Some reports suggest that long term catheters promote bladder stone formation (1, 2) while others have found no difference in risk between those managed with and those managed without indwelling catheters (3, 4). However, previous studies involve small numbers of patients and none have formally controlled for variable follow-up, level or degree of spinal injury by regression analysis. While it is our perception that in our own unit long term catheterisation (suprapubic or urethral) is associated with a higher risk of bladder stones, we decided to establish, by formal statistical analysis, hazard ratios for risk of bladder stone formation relative to type of bladder management in SCI patients with prolonged follow-up.

Methods

The notes of all male and female patients referred to our centre between 1985 and 1990, and with follow-up of >6 months were retrieved (n=452). Data on the following were recorded – age, sex, level and degree of spinal injury, type and duration of bladder management. Details were recorded of admissions for management of urological problems including treatment of bladder stones. A bladder stone was defined as one requiring removal by a stone punch. A Cox Regression analysis was carried out to establish time to first bladder stone and to determine relative risk of stone formation in those managed by condom drainage (n=240), condom drainage and sphincterotomy (n=55), intermittent self catheterisation (ISC, n=71) and indwelling catheterisation (IDC, n=152), controlling for age, sex, level and degree of spinal injury. Since some patients formed more than one stone, a Poisson Regression model was then fitted to the data for visits to hospital for bladder stone treatment for each patient in the patient's follow-up time period, again controlling for the aforementioned variables.

Results

Median follow-up for the whole group was 60 months (lower and upper quartiles 21.5 and 136 months). For individual groups median follow-up was: condom drainage 76 months, condom drainage + sphincterotomy 101 months, ISC 81 months, IDC 74 months. The number of bladder stones by group was: condom drainage 7 stones in 7 patients (3%), condom drainage + sphincterotomy 0 stones (0%), ISC 1 stone in 1 patient (1.5%), IDC 59 stones in 35 patients (23%). Indwelling catheterisation was highly correlated with risk of bladder stone formation independent of age, sex, level and degree of injury, with a hazard ratio of 11.7 ($p<0.0001$, 95% confidence interval 4.9-27.5) when compared with ISC or condom drainage (with or without sphincerotomy). Bladder stones were no more likely to form in those with suprapubic catheters when compared with those with indwelling urethral catheters (hazard ratio 1.2, $p=0.6$). In the Poisson Regression model patients managed with an IDC had a 40 fold increased risk ($p<0.0001$, 95% confidence interval 5.6-291) of requiring admission to hospital for management of bladder stone or other urological related problems, relative to patients managed on ISC and this increased risk was again independent of age, sex, level and degree of injury.

Conclusions

In spinal cord injured patients long term catheterisation is associated with a substantial risk of bladder stone formation and requirement for hospitalisation for stone and other urological treatment, when compared with ISC or condom drainage. This risk occurred independent of age, sex, level and duration of spinal injury. This is likely to translate into increased costs of long term catheterisation over other forms of bladder management. Suprapubic and urethral catheters are associated with similar risks of stone formation, though the relative numbers of patients managed with each type of catheter may not have been enough for us to identify a real difference between catheter sites. Every effort should be made to avoid long term catheterisation in spinal cord injured patients who have hand function sufficient to perform ISC. Where this is not possible, our study allows quantification of the risk of bladder stone formation in those with indwelling catheters and highlights the need for active surveillance for bladder stones in the chronically catheterised patient.

References

1. McGuire EJ, Savastano J. Comparative urological outcome in women with spinal cord injury. J Urol 1986;135:730-731
2. Bennett CJ, Young MN, Adkins RH et al. Comparison of bladder management complication outcomes in female spinal cord injury. J Urol 1995;153:1458-1460
3. Dewire DM, Owens RS, Anderson GA et al. A comparison of the urological complications associated with long-term management of quadriplegics with and without chronic indwelling urinary catheters. J Urol 1992;147:1069-1072
4. Jackson AB, DeVivo M. Urological long-term follow-up in women with spinal cord injuries. Arch Phys Med Rehabil 1992;73:1029