

## Failure of Urethral Catheterisation to Relieve Urinary Retention Reported by a Bladder Scanner

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Bladder scanning is a fast, non-invasive method of detecting the residual volume within the bladder with no risk of infection or trauma. Although highly sensitive, the post void residual volumes reported by bladder scanning is not specific for urine retention; false positive rates of up to 9% have been reported. To increase the awareness of this phenomenon we outline an illustrative case in which a BladderScan (BVI 3000, Verathon, The Netherlands) reported a post void residual volume of 494ml and urethral catheterisation was performed but no urine drained. Bedside abdominal ultrasound eventually demonstrated that the patient had ascites. The BladderScan had misinterpreted this intra-abdominal fluid as urine within the bladder. We therefore recommend that formal diagnostic imaging of the abdomen and pelvis is performed if there is any discrepancy between the urine volume reported by bladder scanning and that measured by urinary catheterization.

**Keywords:** Ascites; BladderScan; Urine Retention**Introduction**

Several techniques are available for the measurement of the volume of urine in the bladder. Urethral catheterization is the gold standard for accurate measurement of bladder volume. However, ultrasonography is a valid and reliable substitute [1,2]. Unfortunately, the use of a standard ultrasonographic machine requires specific training and a mathematic calculation after measurement. This is unsuitable for everyday clinical use by the vast majority of healthcare professionals.

Automatic portable hand-held ultrasound (US) devices (i.e. bladder scanners) have been developed to facilitate the measurement of bladder volume and detect urinary retention. The scanners use ultrasound to automatically calculate the bladder volume. This procedure is commonly known as bladder scanning. The reliability

of bladder scanners is well recognised [3,4]. Their use in clinical practice is now widespread. However, it is important to remember that bladder scanners may report any intra-abdominal fluid (e.g. ascites) as residual urine within the bladder. So abdominal and pelvic ultrasonography must be considered if the residual urine volume obtained on urethral catheterisation does not match that reported by a bladder scanner.

**Case Report**

A 74-year-old obese man presented with increasing confusion, abdominal discomfort, hypotension and anuria 24 hours after amputation of his left 5th toe under general anaesthesia. He had a background of alcohol misuse, hypertension, ischaemic heart disease, atrial fibrillation treated with warfarin, diabetes mellitus and peripheral vascular disease.

A BladderScan (BVI 3000, Verathon, The Netherlands) reported a residual volume of 494 ml (Figure 1). Urethral catheterisation was performed but no urine drained. Several measurements were performed with the BladderScan. On each measurement the BladderScan still reported a residual urine volume of over 450 ml. Passage of the urethral catheter into a false urethral passage was suspected. The urology registrar on call was therefore asked to review the patient. The urology registrar exchanged the 12Fr catheter for a 16Fr catheter. However, no urine drained and the BladderScan still reported a residual volume over 450 ml.

**Figure 1:** Bladderscan image showing post void residual urine.

When pelvic ultrasonography was performed at the bedside this visualised the balloon of the catheter within an empty bladder. Abdominal ultrasonography revealed that the fluid reported by the BladderScan was in fact ascites (Figure 2). The patient's liver also was noted to be cirrhotic. The bladder scanner had misinterpreted ascitic fluid as urine within the bladder.

## Discussion and Conclusion

Many techniques are available for the measurement of the volume of urine in the bladder. Urethral catheterization is the gold standard for accurate measurement of bladder volume. However, urethral catheterisation is invasive, uncomfortable and often causes catheter-associated urinary tract infection.

**Figure 2:** Ultrasound of lower abdomen showing ascites.

Bladder scanning is a fast, non-invasive method of detecting urine within the bladder. It is painless and eliminates the risks associated with urethral catheterization [2-5]. The scan takes less than a minute to perform. The procedure can be performed by any healthcare professional (i.e. does not require a sonographer).

Bladder scanning is currently used in routine clinical practice in many healthcare settings. It is commonly used to detect post-void residual (PVR) urine (i.e. urinary retention) with no risk of infection or trauma [2-5]. However, although highly sensitive, the PVR reported by bladder scanning is not specific for urine retention; false positive rates of up to 9% have been reported [6]. Rarely, this may be due to the misinterpretation of intra-abdominal fluid collections or cysts as urine in the bladder [7].

Ultrasonography is a valid and reliable substitute for urethral catheterisation if accurate measurement of bladder volume is required [1,2]. Ultrasonography can also diagnose other causes of abdominal distension. Unfortunately, the use of a standard ultrasonographic machine requires specific training and a mathematic calculation after measurement. This is beyond the capability of the vast majority of healthcare professionals.

However, we recommend that formal diagnostic imaging of the abdomen and pelvis (i.e. ultrasonography or computed tomography) must be performed if there is any discrepancy between the PVR measured by bladder scanning and that measured by urinary catheterization.

## Conflicts of Interest

None.

## Sources of Funding

None.

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