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Review Article

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A Retrospective Audit of Indwelling Urinary Catheter Practices in Primary Hip Fracture Patients at Fiona Stanley Hospital

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Introduction

The pre-operative utilisation of indwelling urinary catheters (IDCs) has become standard orthopaedic practice in patients with hip fractures with the aim to minimise the incidence of post-operative bladder dysfunction which occurs due to administration of analgesia and anaesthesia [1]. Despite the practical benefits of IDC insertion, there are well-documented associated risks which include hospital-acquired urinary tract infection (UTI), which is positively correlated with its duration in situ-estimated to be around 5-10% each catheter day after the first 48 hours of catheterisation [2]. Hospital-acquired UTIs have significant patient and healthcare costs, resulting in prolonged hospital stay, bacteraemia, prosthetic joint infections, and death [1].

To date, there has been limited and conflicting research on peri-operative bladder management in elderly surgical patients, despite its relevance to nearly all hip fracture patients who undergo major surgery. It was commonly accepted that all hip fracture patients should have an IDC inserted pre-operatively. However, recent evidence from randomised-controlled trials suggests that patients undergoing major joint replacement surgery demonstrate no increased risk of postoperative urological complications without the placement of IDCs. This recent evidence suggests that there is a strong rationale to be judicious in selecting appropriate patients for catheterisation and minimising its duration of insertion. At present, there is no standard protocol or guideline to assist clinicians on whether to implement and apply IDC in hip fracture patients. This paper aims to discuss the evidence behind the efficacy of IDCs in patients with hip fractures and its potential implications in current practice.

Methods

Data was collected from the notes of 168 patients at Fiona Stanley Hospital with primary hip fractures resulting a hospital acquired complication from 19th December 2018 to 4th February 2021. Specific information on patient demographics, premorbid status, anaesthetic and surgical interventions, record and reason for urethral catheterisation, location of insertion, bladder scan performed, reason for IDC insertion, duration of IDC insertion and day of trial of void, and urinary tract infection (UTI) with IDC (confirmed with a positive urine culture and evidence of delirium/sepsis/clinical symptoms) were collated from patient notes. Patients with prior chronic catheterisation were excluded from this retrospective audit. Data that was missing was excluded from the final analysis (i.e., N was the total number of applicable cases with valid data).

Statistical Analysis

Results were analysed using R (V4.0.0; R Core Team, Vienna, Austria). Most of the data was normally distributed as tested by Shapiro-Wilk tests. Univariate comparisons and correlation matrices of normally distributed data were undertaken using parametric analyses and were reported as p-values. As correlation analyses revealed inconsistent findings, multivariate and multinominal analyses were not performed. $p < 0.05$ was considered statistically significant.

Results

The mean age of the study population was 82 years (Table 1) with approximately 60% of the sample being female. Table 1 also illustrates that a great proportion of patient had ischaemic heart disease (36%) and approximately 20% of patient had osteoporosis, osteoarthritis, and atrial fibrillation.

Table 1: Summary of patient demographics and pre-morbid status.

Demographic profile	Mean	Range
Age	82 years	37-106
	n/168	*%*
Sex, % female	99	59
PMHx	n/168	%
% Ischaemic heart disease	60	35.7
% Atrial fibrillation	41	24.4
% Osteoarthritis	30	17.9
% Osteoporosis	30	17.9
% Hypertension	25	14.9
% COPD/Asthma	38	22.6
% Diabetes	48	28.5
% Cerebral vascular accident	19	11.3
% Previous seizure	5	3.0
Premorbid Status	*n/168*	*%*
Chronic confusion	53	31.5
Mobility		
Independent	65	38.7
4WW/frame/walking stick	103	61.3
Bedbound	5	3.0
Incontinent urine	20	11.9
Constipation	13	7.8
Residence		
Home	116	69.0
Nursing home	52	31.0
	Median	*Range*
ASA grade	III	II - IV

Most of the patients were also mobile with an aid (61.3%), followed by quite a high proportion (38.7%) being completely independent. Approximately one-tenth of the patients (11.9%) were incontinent of urine prior to having an IDC inserted; 31.5% had a history of chronic confusion. Most of the patients came from their own home (69.0%) followed by 31% who lived in a nursing home.

The most common operative intervention (Table 2) performed was hemiarthroplasty (47.6%), followed by trochanteric femoral nail (33.3%). In terms of anaesthetics, most of the patients had a femoral nerve block (84.5%) and general anaesthetic (59.5%).

Table 2: Operative and anaesthetic interventions performed when patient was admitted under Orthopaedics.

Indicators	*n/168*	*%*
Surgical Intervention		
Hemiarthroplasty	80	47.6
Trochanteric femoral nail (TFN)	56	33.3
Total hip replacement (THR)	13	7.7
Dynamic hip screw (DHS)	16	9.5
Non-operative	2	1.2
Femoral recon nail (FRN)	1	0.6
	Mean	*Range*
Operation time	117.5	45-270
Intra-operative anaesthetic	n/168	%
Femoral nerve block	142	84.5
General anaesthetic	100	59.5
Sedation	51	30.4
Spinal	47	28.0
PCA/Morphine post-op	17	10.1
	Mean ± SEM	*Range*
Length of stay under orthopaedics (days)	5.8 ± 3.3	1-17

The study (Table 3) illustrated that 90.5% of patient had an IDC insertion. Most of the catheters were inserted in the emergency department (65.8%) with the rest being inserted either on the ward or in theatre. Only 11.2% of patients who had an IDC inserted had a documented bladder scan prior to insertion. The main reason for IDC insertion was due to adherence to the NOF pathway (92.1%). The average time of IDC in situ was 2.7 ± 0.3 days post-operation. Around 34.2% of patients had a day 1 post-operation trial of void. Documentation by the surgical or orthogeriatric team for trial of void resulted in successful trial of void day 1 or 2 post-documentation. Patients who had a

Table 3: Outcome measures for patients that had indwelling catheters (IDC) inserted.

Indicators	*n/N*	*%*
IDC inserted	152/168	90.5
Location		
Emergency	100/152	65.8
Theatre	23/152	14.6
Ward	25/152	14.9
Unable to ascertain	4/152	2.6
Documented bladder scan prior to insertion	11/152	7.2
Reasons for IDC insertion		
NOF pathway	140/152	92.1
Retention	11/152	7.2
Comfort	1/152	0.7
Trial of void care plan	130/152	85.6
	Mean ± SEM	*Range*
Total IDC time (days)	3 ± 0.2	0-21
Total IDC time post-operation	2.7 ± 0.3	0-34
	n/152	%

IDC Removed	151	99.3
Trial of void day 1 post-operation	52	34.2
Documentation for trial of void day 1 post-operation	33	21.7
Reason for delayed trial of void		
Acute kidney injury	8	5.3
ICU post-operation	8	5.3
History of retention	5	3.3
Bowels not open	4	2.6
Paraplegia		
Not documented	126	82.8
Constipation peri-operatively	88	57.9
UTI with IDC	17	11.2
IDC on discharge	1	0.7

As a result of IDC insertion, 11.7% had a documented UTI. Most of the documented UTIs were Escherichia coli. There was only 1 incidence of haematuria, however this patient had a documented history of bladder cancer. Those with a UTI had their IDC in situ longer post-operatively compared to those without a UTI (5.0 ± 1.6 versus 2.3 ± 0.3 days, p = 0.010). There was no recorded evidence of UTI in the group of patients who had an IDC inserted. Comparing those with and without IDC insertion, there was no difference in length of stay (5.8 ± 3.3 versus 5.9 ± 3.2) (p = 0.80). Although the odds ratio of developing a UTI was 4.26 (0.24-74.21), this was not statistically significant (p=0.16).

Discussion

This audit revealed a higher incidence of short-term IDC insertion (~90%) in elderly patients with neck of femur fractures in comparison to previous studies which demonstrated that around 75% of all elderly patients with hip fractures have an IDC inserted, which is 4-5 times higher compared to general inpatients [5]. The general indications for IDC insertion include urinary retention, accurate urine output measurements, bed bound or comatose patients, urine specimen collection, and bladder management in the post-operative setting. In the context of patients in hip fractures, IDC insertion reduces the incidence of post-operative bladder dysfunction as the majority of patients are immobile, confused, receive analgesics and opiates, have increased intravenous fluid intake and receive anaesthesia [6]. A combination of these factors can result in impaired awareness of bladder fullness, bladder overdistension or an inability to void which justifies their insertion [6]. In the case of our site, the majority of IDC insertions did not have a clinical indication, rather adherence to the hip fracture pathway guidelines.

Previous studies have shown that IDCs have been inserted inappropriately, with around 30% of hip fracture patients having had an IDC inserted due to urinary incontinence, which is already prevalent in 25% of elderly people [1]. In our audit, we found 11% of patients to have a history of urinary incontinence who had an IDC inserted. It is important to identify, investigate and treat the reversible causes of urinary incontinence such as delirium, diuretic use, polyuria secondary to poorly controlled diabetes and hypercalcaemia. Furthermore, it is also important to treat specific groups of patients with urinary incontinence (such as overactive bladder, stress, mixed and overflow incontinence) with the appropriate tests (e.g., post-micturition bladder scan) and treatment (e.g., bladder retraining, regular toileting, pelvic muscle floor exercises). Therefore, IDCs should be considered as a last resort option for urinary incontinence.

Having an IDC inserted for greater than 48 hours is associated with an increased risk of urinary retention and infection [7]. Catheters should routinely be removed when patients are able to get out of bed for the first time, usually on the first post-operative day. In our audit, patients had their IDC in situ for around 2.5 days post-operatively with only 34% having a day 1 post-operation trial of void. If urinary retention occurs after removal of the catheter, the best evidence suggests that intermittent straight catheterization should be used to maintain low bladder volumes and decrease the risk of UTIs [8]. Furthermore, intermittent catheterisation has been shown to promote the return of normal bladder function faster than indwelling catheterization [8, 9]. With the advent of bedside ultrasound bladder scanners to assess bladder volume noninvasively, straight catheterization should be used only when scanned volumes exceed 500 mL of urine or when the patient reports any physical discomfort. Our audit showed that documentation of bladder volumes were poor with only 7% documented prior to IDC insertion. If an indwelling catheter is necessary to monitor urinary output, the duration should be limited to a maximum of 24 hours. The most beneficial and consequential effect of avoiding use of an indwelling urinary catheter is likely the ability to facilitate early postoperative mobilization of the patient [10].

Despite the evidence suggesting succinct practice recommendations regarding optimal use of IDC insertion, their application to clinical practice has been poor. Bell & Michael's (2020) UK audit of 43 hip fracture patients demonstrated that despite the best recommendation to attempt a trial of void (TOV) on the first post-operative day, only 12% had a TOV within 3 post-operative days and no patients had a reason for their TOV documented in their clinical notes [9, 11]. Reasons for the low TOV rate can be attributed to the lack of clear guidelines, reluctance to have a TOV for older patients with postoperative mobility with concerns regarding inability to reach the toilet timely, reluctance to have a TOV for those who did not open their bowels post-operatively and time resources

and pressure [11]. This can be improved in our department by improving the education of nursing staff and communication from the orthopaedic team to other health professionals to ensure that a day 1 post-operation trial of void is achieved.

The rate of UTIs following IDC insertion in our audit was 11.7% - which is significantly lower than that previously documented in the literature. On average, the UTI rate with IDC insertion up to two weeks in patients with hip fractures is around 30% [1]. A UTI with IDC insertion is known to have significant implications in hip fracture patients, being associated with prolonged hospital stay, bacteraemia, prosthetic joint infections, sepsis and death.(1) Furthermore, other complications of IDC insertion include pain and discomfort, urinary symptoms, development of bladder or kidney disease, haematuria and permanent urethral stricture disease can contribute to the development of delirium in hip fracture patients [7]. In our audit, no patients experienced a urological complication as a result of IDC insertion. Wald et al's (2005) large-scale study from the USA demonstrated that 32% of patients discharged with a hip fracture had IDCs, which had a 60% increased chance of readmission due to UTI at 30 days compared to no IDC on discharge. Furthermore, their study showed having an IDC on discharged was also dependent on the hospital (with public hospitals less likely to discharge hip fracture patients with IDCs), suggesting that there are hospital-dependent policies which may influence hip fracture patient outcomes [10].

In recent years, with the development of surgical and anaesthesia techniques, intraoperative blood loss has gradually decreased in major joint replacement surgeries, thus making intraoperative fluid control less important. In addition, the development of clinical pathways has achieved meaningful development and improved outcomes in patients with hip fractures [12, 13]. Therefore, it also raises questions about the need for catheterization before surgery. To date, there has only been two randomised controlled trials which have compared IDC versus no IDC in total hip arthroplasty [14, 15]. Both of these studies had both arms of the study consist of patients greater than 65 years of age undergoing elective total hip arthroplasty and demonstrated that there was no significant difference in the rates of urinary retention, duration of surgery or length of hospital stay when comparing groups with and without IDC insertion. In our brief retrospective analysis based on our data, there was no difference in length of stay in our orthopaedic ward comparing those who had an IDC inserted versus those that did not. However, these studies did show that patients with IDCs had a higher risk of UTI compared to those without IDCs. However, it must be appreciated that most of these patients had THAs for osteoarthritis and are likely to be younger and healthier than the typical demographic of those who sustain hip fractures. We were unable to demonstrate that IDC insertion increased the risk of UTI in our audit, probably due to our low numbers, however all the patients who did not have an IDC inserted did not have a UTI.

Huang et al's (2015) study involving 314 patients who underwent total knee arthroplasty and randomized them to receive either an IDC or not before the surgery demonstrated that the prevalence of postoperative urinary retention was quite low in both groups (5.7% vs 6.4%) [15, 16]. In our audit, we demonstrated that there were no post-operative IDC insertions due to retention. Furthermore, through multivariate logistic regression models they demonstrated that age, male gender and ASA grade were considered as unmodifiable risk factors [16]. As for operative time and intraoperative intravenous infusion, with the development of surgical techniques and the importance of perioperative management, these risk factors can be well controlled through the use of tourniquet tranexamic acid and blood transfusion. These measures can significantly reduce intraoperative blood loss, and the requirement for such intraoperative fluid control is less important. In a prospective study, Karason et al (2013) found a correlation between post-operative urinary retention and bladder volume before anaesthesia, suggesting that preoperative bladder residual urine volume greater than 100 ml was a risk factor for post-operative urinary retention, while bladder emptying before anaesthesia was a protective factor [16, 17].

Conclusions

- 90% of hip fracture patients have an IDC inserted, with the majority inserted in the emergency department.
- Documentation of time of insertion and bladder scans was poor with only 7% adherence.
- 86% of patients with an IDC had a trial of void care plan.
- Only 34% of hip fracture patients had a trial of void day 1 post-operation, with 83% demonstrating no documented reason.
- When the operating surgeon or post-operative review doctor stated in their plan for a day 1 trial of void, this was acted upon.
- Rate of UTI with IDC insertion was around 11%, however taking to account this was from a cohort of hospital acquired complications, the actual rate is much lower than this.
- Acquiring a UTI was associated with greater time of IDC in situ.
- Length of stay under orthopaedics is no different for those with an IDC compared to no IDC.

Recommendations

- Consider selecting patients who have a high risk of retention for IDC insertion.
- Stating in either post-operative instructions or post-operative review note for trial of void will increase the likelihood of a day 1 post-operation trial of void rather than just writing 'NOF pathway'.
- Consider intermittent catheterisation for urinary retention instead of re-catheterization.
- Consideration of an RCT to compare IDC versus no IDC and outcomes in neck of femur fracture patients.

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