

Role of percutaneous nephrostomy in end of life prostate cancer patients: a systematic review of the literature

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Introduction Prostate cancer is the most common cancer amongst men in the UK. Treatments for malignant ureteric obstruction consist of percutaneous nephrostomy, ureteric stent insertion, or occasionally other forms of urinary diversion. Our aim was to look at the outcomes of percutaneous nephrostomy (PCN) in patients with advanced prostate cancer and to look at the impact on patient's general health, quality of life, life expectancy and complications after PCN insertion.

Material and methods A systematic review of the literature was done for all prospective English language articles on PCN in patients with prostate cancer using PubMed, MEDLINE, EMBASE, Scopus, CINAHL, Cochrane library, Clinicaltrials.gov, Google Scholar and individual urological journals from inception to August 2017. While studies involving prostate cancer patients were included, studies on all other mixed pelvic malignancies were excluded.

Results Seven articles met the inclusion criteria. There were 184 patients, with a mean age of 70 years (range: 51–94 years). PCN was performed for ureteric obstruction due to advanced prostate cancer, patients underwent unilateral (n = 66) or bilateral PCN (n = 118) with conversion to an antegrade stent in 25 patients. Their post-PCN survival varied between 4–31 months and this was longer if they were hormone naïve or showed a good recovery in their renal function. Although the complication rates were low (1–3%), patients spend a high proportion of their lives in the hospital.

Conclusions PCNs should only be pursued after thoughtful counselling regarding further treatment options and prognosis as these patients with advanced malignancies seem to have reduced survival duration and spend a significant amount of time in hospital.

Key Words: malignancy ◊ nephrostomy ◊ obstruction ◊ prostate cancer ◊ quality of life

INTRODUCTION

Prostate cancer is the most common cancer amongst men in the UK, with 46,690 new cases diagnosed in 2014 [1]. The incidence is rising, with a 44% increase in incidence since the 1990s and although many men are now diagnosed early, between 17–34% of patients in the UK are diagnosed when they already have metastatic or locally advanced disease (Stage IV) [1]. Patients with advanced prostate cancer and malignant urinary obstruction might present late or as their disease progresses on treatment. The clinical

manifestations range from symptoms of uraemia, such as non-specific lethargy, anorexia, nausea/vomiting, anuria and confusion, to symptoms of fluid overload, such as pulmonary oedema and ankle swelling, to flank pain, persistent urinary tract infections or sepsis [2, 3]. Treatments for malignant urinary obstruction consist of percutaneous nephrostomy (PCN), retrograde or antegrade stenting, or occasionally other forms of urinary diversion, such as ileal conduit, subcutaneous pyelovesical bypass or ureteroneocystostomy [3, 4, 5]. These patients with advanced malignancy are poor surgi-

cal and/or anaesthetic candidates, especially in the context of significant renal impairment, and therefore in the acute phase, procedures that avoid general anaesthesia are generally preferred. It is often not technically possible to insert primary retrograde stents due to local advancement of prostate cancer into the trigone, obliterating the ureteric orifices, but technical success of insertion of PCN is high at 96–98% [6, 7, 8].

Although research on advanced/metastatic prostate cancer is ongoing and treatment options keep improving, prognosis remains guarded, especially in patients developing obstructive uropathy despite previous hormone treatment. The limited life expectancy highlights the importance of maintaining their quality of life (QOL) in this difficult period. Percutaneous nephrostomies can be associated with complications such as skin excoriation, urine leakage, tube dislodgement/displacement/blockage, recurrent infections, haematuria, need for multiple readmissions and reinsertions, and the presence of a nephrostomy bag for urine drainage [9]. In some cases, patient will have bilateral nephrostomies, potentially in addition to a urethral catheter, meaning they have two or three drainage bags to manage, thus impacting significantly on their QOL.

Most studies looking at malignant urinary obstruction cover a heterogeneous population and look at obstructive uropathy in multiple different malignancies rather than sole disease states. Our aim was to look at the outcomes of PCN in patients with advanced prostate cancer and to look at the impact on patient's general health, quality of life, life expectancy and complications after PCN insertion.

MATERIAL AND METHODS

Evidence acquisition:

Inclusion criteria

- Studies reporting on patients with prostate cancer who underwent PCN for malignant urinary obstruction.
- Prospective studies written in the English language from inception to August 2017.

Exclusion criteria

- PCN insertion for benign disease
- PCN in other pelvic malignancies (such as bladder, gynaecological, or colorectal malignancy)

Search strategy

The systematic review was performed according to the Cochrane reviews guidelines and the Pre-

ferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [10]. We searched PubMed, MEDLINE, EMBASE, Scopus, CINAHL, Cochrane library, Clinicaltrials.gov, Google Scholar and individual urological journals from inception to August 2017, and all English language articles were included in the original search. The search terms included; 'Nephrostomies', 'Percutaneous Nephrostomies (PCN)', 'nephrostomy', 'urinary drainage', 'prostate', 'Prostate cancer' and 'urological malignancies'. Boolean operators (AND, OR) were used with the above search terms to refine the search. Studies reporting on the outcomes of PCN in prostate cancer were included, but studies that included other types of pelvic malignancy, even if that included prostate cancer, were excluded unless data for prostate cancer patients could be extracted and analysed separately.

RESULTS

Literature search and included studies

After an initial search of 116 articles, 7 (184 patients) met the inclusion criteria for the final review (Figure 1), with the first paper published in 1990. All included studies were retrospective in nature and the overall quality of evidence was poor. A full breakdown can be seen in Table 1.

Patient characteristics

There were 184 patients with a mean age of 70 years (range: 51–94 years), which included patients with either newly diagnosed advanced prostate cancer or disease progression over time. Patients underwent unilateral (n = 66) or bilateral PCN (n = 118)

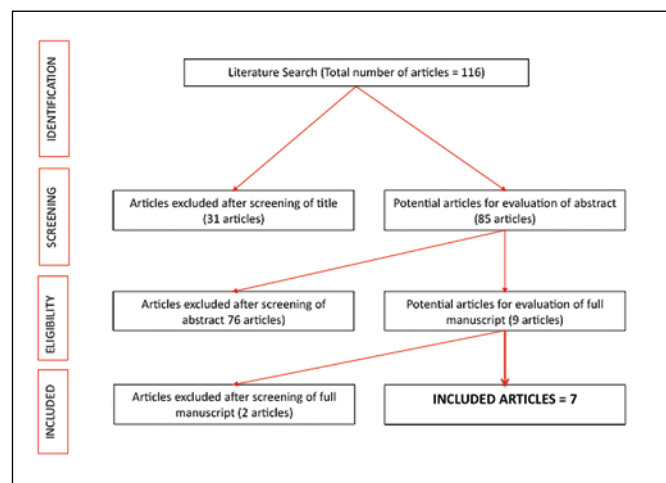


Figure 1. PRISMA Flow chart of the included studies.

Table 1. Complete breakdown of the study characteristics

Author	Year published	Journal	Review period	Mean age (years)	Patient number	Median survival post PCN (months)
Chio RK, Chang WY, Horan JJ [14]	1990	The Journal of Urology	1978–1984	73	37	21
Dowling RA, Carrasco CH, Babaian RJ [15]	1991	Urology	1980–1985	67	22	4
Nariculum J, Murphy DG, Jenner C et al. [11]	2009	British Journal of Radiology	1998–2006	71	25	7.5
Bigum LH, Spielman ME, Juhl G, Rasmussen A [9]	2015	Scandinavian Journal of Urology	2014	73.5	10	Median overall survival 4.5 months
Harris MRE, Speakman MJ [12]	2006	Prostate cancer and Prostatic Diseases	2001–2004	Not given	26	4.4 (mean)
Paul AB, Love C, Chisholm GD [5]	1994	British Journal of Urology	1978–1993	Median 70	36	31 (mean)
Malik MH, Mahmood T, Khan H [13]	2010	PJMHS	2001–2009	68	28	15 (mean)
Total					184	

PCN – percutaneous nephrostomy

Table 2. Complications of nephrostomy insertions

Study	Infection/ Sepsis	Malposition/occlusion/ dislodgment	Perirenal haematoma	Death	Haematuria
Dowling et al. [15]	2/22	4/25	1/22	–	–
Nariculum et al. [11]	1/25	1/25	–	–	1/25
Paul AB et al. [5]	2/16	1/16	–	1/16	–

with conversion to an antegrade stent in 25 patients (see Table 2).

The prostate specific antigen (PSA) level was documented in only 3 of the 7 studies, with the mean PSA level being 220 [11, 12, 13]. This ranged from a mean of 96.2 (5.7–547) in one study [11] to a mean of 476 (0.1–7357) in a second study [12]. The renal function pre and post PCN was documented in these three studies and showed a good improvement. One demonstrated a drop from 612 μmol pre PCN to 187 μmol post PCN [11], while Harris et al. split the patients into 3 groups; hormone naïve patients improved their creatinine by 63%, hormone responsive patients by 60% and hormone resistant by 48%. They also showed that if the creatinine level improved to a level below 250 μmol in 2 weeks, the patient's survival time post PCN was increased significantly. Malik et al. divided the patients into two groups, group A with bilateral PCN insertion and group B with unilateral, and they showed no statistical difference in creatinine improvement between the two groups [13].

Primary outcomes

Survival times after percutaneous nephrostomy

Four studies stated median survival post-PCN that ranged between 4–21 months [9, 11, 14, 15]. The other three studies stated their mean survival time

as 31, 4.4 and 15 months respectively [5, 12, 13]. Nariculum et al reported a 55% survival at 1 year, 36% at 2 years and 14% at three years [11] and Chio and colleagues showed an average survival of 16 months for hormone naïve patients and 4.5 months for hormone relapsed patients [14].

Complications of percutaneous nephrostomy

Three studies documented complications, dislodgment or malpositioning requiring replacement was the most common complication, followed by urinary sepsis. There was a 1–3% complication rate across the three studies (Table 2) [5, 11, 15]. Malik et al. briefly mention a complication rate of 4–26%, which was the same in bilateral and unilateral insertion, but did not document what these complications were [13]. Of the other 3 studies, two did not document any complications [9, 12] and one reported no complications post-PCN [14].

The readmission rate was only documented in 2 studies. One study [9] just stated that 'multiple' readmissions were made, while the other had almost half of their patient cohort re-admitted [15]. Dowling et al. also documented on the proportion of post-PCN life that their patients stayed in hospital. While patients spent a mean of 41% of their post-PCN life in hospital, 6 patients spent all of their life in hospital after their PCN. Harris et al. split the patients into

three categories; hormone naïve patients, hormone responsive and hormone resistant, showing 83, 45 and 27 days respectively spent in hospital, on average in each group.

Treatment received for prostate cancer

The main stay of treatment in all of the studies was Androgen Deprivation Therapy (ADT), including orchidectomy, stilboestrol and LHRH analogues. In most of the studies, about half of the patients had already received hormones prior to PCN insertion.

In Chiou et al. they also used iv diethylstilbestrol disphosphonates and radiotherapy directly to the ureters, but no improvement was seen in any of the patients in which they were used [14]. In two other series, eight patients received chemotherapy in one [15], and six in the other [9], in addition to hormonal manipulation, but the outcomes specific to chemotherapy were not documented in either [9, 15].

The time from diagnosis with prostate cancer to PCN insertion was highly variable. Only 3 studies documented this [5, 14, 15]. Although the time

from presenting with malignant urinary obstruction to having PCN 12 years after their initial prostate cancer was variable, the mean time across these three studies was 42 months (Table 3).

Bilateral versus unilateral percutaneous nephrostomy

In total, two-thirds of patients underwent bilateral nephrostomy and one third underwent unilateral nephrostomy. In five studies [9, 11–14], patients did not have this converted to stents, with the majority (86%) staying with their long-term PCN. With the exception of Paul et al., all of the studies inserted a mixture of bilateral and unilateral PCN. In Nariculum et al., they inserted a mixture of bilateral and unilateral nephrostomies into patients who had bilateral hydronephrosis [11]. However, they demonstrated that inserting only one PCN still improved the patients' creatinine by the same amount as insertion of bilateral PCN. Malik et al. divided their data into patients who underwent unilateral and bilateral PCN, showing equal improvement in the renal function in both groups, however, not commenting as to whether both groups had bilateral hydronephrosis pre- PCN insertion [13]. Chiou et al. also inserted unilateral nephrostomies, but this was only in patients with unilateral obstruction, and they demonstrated no difference in the length of survival in these two groups [14]. Harris et al. demonstrated that in the patients that underwent unilateral decompression the survival rate was longer, but 5 out of 12 of these patients who had a single PCN inserted had unilateral hydronephrosis [12]. (See Table 4 for full breakdown)

QOL after percutaneous nephrostomy

Only one study looked specifically at patients QOL with PCN [9]. The other studies did not comment on the patients QOL with the nephrostomy in situ. By using a semi-structured interview technique involving a 'mind-map', Bigum et al. showed that only one person received the news of a PCN positively as 'saving their life' [9].

Once the PCN was in, they showed that the patients feared the times that it had to be changed, either as a routine change or when it stopped working. This was due to previous discomfort, pain and previous failed changes. Most of their patients struggled with the day-to-day tasks of looking after the nephrostomy, and found lack of knowledge and support in the home care nursing staff regarding nephrostomies. Bigum et al. concluded that if the patient received benefit from the PCN, such as were able to

Table 3. Prior treatment pre-PCN

Study	No. of patients treated with ADT pre-PCN	Time (months) from diagnosis to PCN (mean)
Chio et al. [14]	22/37	73 (2–146)
Dowling et al. [15]	22/22	25 (1–136)
Nariculum et al. [11]	18/25	ND
Bigum et al. [9]	ND	ND
Harris et al. [12]	24/26	ND
Paul et al. [5]	8/16	29
Malik et al. [13]	ND	ND

ADT – androgen deprivation therapy, PCN – percutaneous nephrostomy, ND – not documented

Table 4. Unilateral versus bilateral percutaneous nephrostomy

Study	Unilateral	Bilateral	Conversion to stents
Chio et al. [14]	11	26	0
Dowling et al. [15]	16	6	0
Nariculum et al. [11]	7	18	0
Bigum et al. [9]	9	1	0
Harris et al. [12]	12	14	20
Paul et al. [5]	0	36	5
Malik et al. [13]	11	17	0

receive from chemotherapy, improved renal function or improved pain, then they were much more accepting of it [9].

DISCUSSION

Findings of our study:

The median survival time varied widely across the studies, from 4 to 31 months post PCN, being longer if they were relatively hormone naïve or showed a good recovery in their renal function. Although the complications of PCN were low across the studies (1–3%), the number of days spent in hospital post PCN was high. It is difficult to ascertain whether this is due to the PCN, or to the progression of the cancer itself, as reasons for admission were not documented.

Patient counselling for percutaneous nephrostomy

With patients who have previously diagnosed and progressive disease despite treatment, the challenge becomes to manage patient and family expectations, and this relies on early discussions about the course of the disease, and at each stage, what the patient would want should renal failure from malignant urinary obstruction occur. This should be done in conjunction with oncology and palliative care colleagues where appropriate. Predictors of worse outcomes unsurprisingly are where patients are castrate resistant compared to new diagnosis/hormone naïve patients. In previously diagnosed patients, PCN should only be pursued after thoughtful counselling regarding further treatment options and likely prognosis, as patients may prefer a relatively painless uraemia as the cause of death, rather than undergoing intervention and subsequent worsening symptoms from their prostate cancer.

Importance of up to date data as advancing treatment in prostate cancer

Although research on metastatic prostate cancer is ongoing and treatment options keep advancing, there remains a limited prognosis, especially in patients developing obstructive uropathy despite previous hormone treatment. Past opinion used to favour avoiding PCN in hormone resistant patients [5]. The introduction of docetaxel chemotherapy and androgen-receptor blockers such as abiraterone/enzalutamide, has had a significant improvement in life expectancy for late stage prostate cancer patients. This data may change patient selection for PCN and if they can receive chemotherapy post-PCN, their life

expectancy may be prolonged. Hence, PCN and the risks it entails may benefit the patients more than previously thought, where there was limited choice for advanced and metastatic prostate cancer. They also may be able to spend longer time-periods out of hospital, if their cancer is being actively treated, with adequate nursing and palliative care support.

Role of ureteric stents

Internal ureteric stents generally tend to fare better with regards to QOL for patients, however, in advanced malignancies due to external compression these tend to get blocked and changing them can be prone to failure due to advancing disease [3]. Also, retrograde stent changing often needs general anaesthesia which gets more challenging as a patient deteriorates through the course of their progressive malignancy, and ultimately when stenting fails, nephrostomies may end up being reinserted in the end stages of their disease.

Quality of life

Unfortunately, there is no validated QOL tool for PCN. Only one study mentioned QOL, and this study was focused only on QOL [9]. Using a standardised generic tool such as the EORTC QLC-30 [16] (a questionnaire designed to assess the quality of life of cancer patients) would be a good place to start. Although it is difficult to ascertain whether the QOL after PCN insertion is truly worse due to the PCN, or the inevitable progression of the cancer and the effect this will have on the patient's QOL, it would be helpful to explain accurately to patients the type of symptoms and side effects they may experience, and this could help aid them with their choice of whether to have a PCN or not.

Limitations of the study

There were few studies that focused specifically on PCN in prostate cancer, and with small numbers, it makes it difficult to compare the studies and draw conclusions from them. Although the risk of bleeding from PCN was low in the included studies, this is a known complication and patients must be counselled for this. Similarly, PCN placement has previously shown to have a major complication rate of 4–8% and a minor complication rate of 3–15% [17]. Prostate cancer treatment has changed, and with the introduction of new chemotherapy, hormonal and novel agents, life expectancy post failure of standard androgen deprivation therapy has increased. This means that patients may well have longer to

live post-PCN insertion. In these circumstances, as well as with poor prognosis, QOL should also be assessed. In some situations, it may be possible to convert back to antegrade ureteric stents for a period if there is response to treatment. Similarly, in patients reliant upon nephrostomy drainage, a careful consideration of unilateral or bilateral PCN needs to be made. Nariculum et al. demonstrated the same volume of improvement in creatinine post unilateral PCN and bilateral PCN in patients with bilateral obstruction [11].

Areas of future research

Larger studies and studies that consider newer treatment modalities for prostate cancer with increased median length of survival, need to look at the effect of PCN in these patients. It is unclear whether these patients have ongoing pain or anxiety and how this affects their QOL. There is a lack of patient-centered data on how well these patients tolerate PCN

or whether they want to prolong their survival with help of a PCN. Developing a meaningful measurement of QOL before and after PCN in advanced prostate cancer patients would be beneficial to counseling them for informed decision making as to whether they should have a PCN.

CONCLUSIONS

Decompression of an obstructed urinary system should only be pursued after thoughtful counseling regarding further treatment options and prognosis as patients with advanced malignancies seem to have reduced survival duration and spend a significant amount of time in hospital. With recent new advances in advanced prostate cancer treatment, the overall life expectancy, quality of life and living with PCN will be an area of further research.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

References

1. Cancer Research UK. <http://www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/prostate-cancer/incidence>. Accessed August 2017.
2. Kouba E, Wallen EM, Pruthi RJ. Management of ureteral obstruction due to advanced malignancy: Optimising therapeutic and palliative outcomes. *J Urol*. 2008; 180: 444-450.
3. Friedlander JI, Duty BD, Okeke Z, Smith AD. Obstructive Uropathy from Locally Advanced and Metastatic Prostate Cancer: An Old Problem with new therapies. *J Endourol*. 2012; 26: 102-109.
4. Heidenreich A, Porres D, Pfister D. The Role of Palliative Surgery in Castration-Resistant Prostate Cancer. *Oncol Res Treat*. 2015; 38: 670-677.
5. Paul AB, Love C, Chisholm GD. The management of bilateral ureteric obstruction and renal failure in advanced prostate cancer. *Br J Urol*. 1994; 74: 642-645.
6. Radecka E, Magnusson A. Complications associated with percutaneous nephrostomies. A retrospective study. *Acta Radiol*. 2004; 45: 184-188.
7. Wah TM, Weston MJ, Irving HC. Percutaneous nephrostomy insertion: outcome data from a prospective multi-operator study at a UK training centre. *Clin Radiol*. 2004; 59: 255-261.
8. Patel U, Hussain FF. Percutaneous nephrostomy of nondilated renal collecting systems with fluoroscopic guidance: technique and results. *Radiology*. 2004; 233: 226-233.
9. Bigum LH, Spielman ME, Juhl G, Rasmussen A. A qualitative study exploring male cancer patients' experiences with percutaneous nephrostomy. *Scand J Urol*. 2015; 49: 162-168.
10. Liberati A, Altman D, Tetzlaff J. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. *BMJ*. 2009; 339: 2700.
11. Nariculum J, Murphy DG, Jenner C, et al. Nephrostomy insertion for patients with bilateral ureteric obstruction caused by prostate cancer. *Br J Radiol*. 2009; 82: 571-576.
12. Harris MRE, Speakman MJ. Nephrostomies in obstructive uropathy; how should hormone resistant prostate cancer patients be managed and can we predict who will benefit? *Prostate Cancer Prostatic Dis*. 2006; 9: 42-44.
13. Malik MA, Mahmood T, Khan JH, Hanif A, Bajwa IA. Experience of Percutaneous Nephrostomy (PCN) in Advanced CA Prostate. *PJMHS*. 2010; 4: 537-541.
14. Chio RK, Chang WY, Horan JJ. Ureteral obstruction associated with prostate cancer: the outcome after percutaneous nephrostomy. *J Urol*. 1990; 143: 957-959.
15. Dowling RA, Carrasco CH, Babaian RJ. Percutaneous urinary diversion in patients with hormone-refractory prostate cancer. *Urology*. 1991; 37: 89-91.
16. Aaronson NK, Ahmedzai S, Bergman B, et al. The European Organization for Research and Treatment of Cancer QLQ-C30: a quality-of-life instrument for use in international clinical trials in oncology. *J Natl Cancer Inst*. 1993; 85: 365-376.
17. Wah TM, Weston MJ, Irving HC. Percutaneous nephrostomy insertion: outcome data from a prospective multi-operator study at a UK training centre. *Clin Radiol*. 2004; 59: 255-261. ■