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Percutaneous Nephrostomy in Patients with Tumors of Advanced Stage: Treatment Dilemmas and Impact on Clinical Course and Quality of Life

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ABSTRACT

***Objectives*: The purpose of this study was to evaluate the outcome, in respect to safety, survival, and quality of life (QoL), after performance of percutaneous nephrostomy in patients with obstructive nephropathy caused by various types of advanced malignancy.**

***Patients and Methods*: A cohort of 270 patients with established nephropathy because of advanced pelvic or nonpelvic tumors was evaluated. A decision to obtain percutaneous access was made; primary stenting had either failed or was not feasible because of complicated anatomy. Patients were divided in equal groups by type of malignancy (54 patients each). In addition, each malignancy group was further divided in two equal subgroups by tumor burden (27 patients each). Correlations were made with respect to renal function outcome, overall survival after the procedure, and QoL differences both before and after the procedure.**

***Results*: No serious complications, such as severe bleeding or sepsis, were experienced because of the procedure. Statistical analysis showed no significant differences in survival among patients with different types of cancer. Only patients with prostate ($P < 0.0365$) and colorectal ($P < 0.0307$) cancer with lower tumor burden had significantly longer survival when compared with patients with large tumor burden. Regarding QoL scores, only patients with prostate cancer in the subgroup with low tumor burden demonstrated a positive statistically significant difference ($P < 0.001$).**

***Conclusions*: Despite the fact that percutaneous nephrostomy has shown good safety characteristics and beneficial impact on renal function, only patients with specific cancers most likely to respond to ongoing palliative therapy or with cancers that progress slowly by nature may statistically benefit from the procedure. This questions the universal application of this procedure for all types and stages of advanced malignancy.**

INTRODUCTION

PATIENTS WITH advanced cancers often have had the disease a long time before renal function is compromised. They usually have experienced significant physical or psychological distress that has rendered them weak physically and mentally. By definition, palliative care medicine aims to support quality of life (QoL) in patients facing end-stage disease by applying appropriate methods to prevent suffering. This effort also produces significant side benefits to patients' families or to institutions that provide for these patients.

Because of the frequent complications that arise in the urinary system in patients with advanced stages of malignant diseases, urologists have a unique position in this setting. Nevertheless, not all health professionals or, specifically, urologists are accustomed to treating patients with advanced end-stage disease. Supportive, palliative, and curative treatment options often fuse during efforts to successfully treat these patients. Ethical questions may also arise in this environment in which there is relatively limited experience.

Obstructive uropathy is a common condition in patients with advanced pelvic malignancy that requires appropriate manage-

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Table 1. Causes of Obstructive Nephropathy That Required Nephrostomy Tube Placement 1985–2003

Sex		*Malignancy*	*Number (%)*	*Subgroups*[a]
Total patient cohort 507 patients	Men: 409 (80.5%)	Bladder	166 (40.5%)	A: 57 B: 109
		Prostate	131 (32%)	A: 81 B: 50
		Colorectal	78 (19%)	A: 27 B: 51
		Gastric/pancreatic	14 (3.5%)	A: 4 B: 10
		Other sites	20 (5%)	A: 8 B: 12
Subgroups A: 213 patients B: 294 patients	Women: 98 (19.5%)	Uterus/cervix/ovaries	69 (70.5%)	A: 24 B: 45
		Breast	5 (5%)	A: 0 B: 5
		Colorectal	9 (9%)	A: 3 B: 6
		Other sites including bladder tumors	15 (15.5%)	A: 9 B: 6

[a]A = locally extended disease; B = largely disseminated disease.

ment to help the general condition of the patient. Other neoplasms that do not originate in the minor pelvis may produce a similar clinical course. Among the options for improvement of renal function, stenting of the ureters may not be always feasible or successful. A next option may be urinary diversion by either open or percutaneous techniques.

While the optimal management of ureteric obstruction caused by malignancy remains under debate, percutaneous nephrostomy is widely regarded as a permanent solution for urine deviation in this setting. Despite its safety characteristics, however, its successful application as a palliative method for advanced cancer can become challenging even in experienced hands. Moreover, the impact of the procedure on the clinical course as well as prognosis can be debated, because assessment is difficult and different arbitrary definitions have been used.[1]

The aim of this study is to describe the technical aspects of percutaneous drainage in this group of patients and discuss its position as a palliative method with respect to patients' clinical course, overall survival, and QoL after its application.

PATIENTS AND METHODS

We constructed a large database including patients (N = 507) who presented with obstructive nephropathy caused by advanced malignancy and who underwent percutaneous nephrostomy. These patients were treated at two large urologic departments in Germany* and Greece† during a period of 18 years (Table 1). Data for the 507 patients demonstrated that urologic malignancies predominated in men (72.5%) and cancer of the genitals was most common in women (70.5%). Also, the majority of cases represent largely disseminated disease, with the exception of prostate cancers. The average age of patients was 63 years (range 40 to 86 years).

For our study purposes, we assembled data from the most recent cases-between 1996 and 2003 (338 patients)—because by then, we introduced a new QoL questionnaire (EORTC QLC-C30 [version 2.0] questionnaire) to assess our patients.

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Table 2. Overall Survival Within Specific Groups of Patients

	Survival (in days)		
Type of malignancy	*Overall group (54 patients)*	*Subgroup A*[a] *(27 patients)*	*Subgroup B*[a] *(27 patients)*
Bladder	8–270	8–270	34–250
Prostate	22–723	58–723	22–204
Gynecologic	7–269	7–269	22–250
Colorectal	9–272	58–272	9–220
Other sites	8–280	8–280	8–255

[a]A = locally extended disease, B = largely disseminated disease.

For statistical purposes, we constructed a new database of the patient cohort treated between 1996 and 2003 that contained equal numbers (54 patients) among different malignancies. There were also equal subgroups (27 patients) with regard to tumor burden within each type of malignancy.

The final study cohort included 270 patients who were divided first by cancers into 5 large groups: bladder cancer, prostate cancer, gynecologic malignancies (ie, ovarian, cervical, or breast cancers), colorectal cancer, and other types of malignancies (including gastric, pancreatic, lymphomas, and others). These groups were subdivided further by disease extent into two equal subgroups (27 patients each) within each type of malignancy. This latter subdivision did not follow a detailed pattern but generally represented tumor burden as follows: patients with locally extended malignancy that affected the urinary system were considered as subgroup A, while patients with largely disseminated disease that produced obstructive nephropathy were classified as subgroup B. Patients with enlarged lymph nodes were classified usually in subgroup B, as were patients with distant metastases (M^+).

Uremia was the main presenting symptom in the majority of patients (88%), while fewer patients (12%) were treated who had established oligoanuria. The obstruction was bilateral in 92% of patients, and the side of the nephrostomy was chosen based on parenchymal thickness demonstrated by ultrasonography. Only 22 patients (8%) had a solitary functional hydronephrotic kidney. Retrograde stenting was either unsuccessful or not attempted because of anticipated complicated anatomy. The technique of the percutaneous approach was identical in all cases.

Overall survival after the procedure was recorded for each patient, and differences encountered were presented and discussed. Information on survival duration came from institutional databases, community physicians, and patients' relatives.

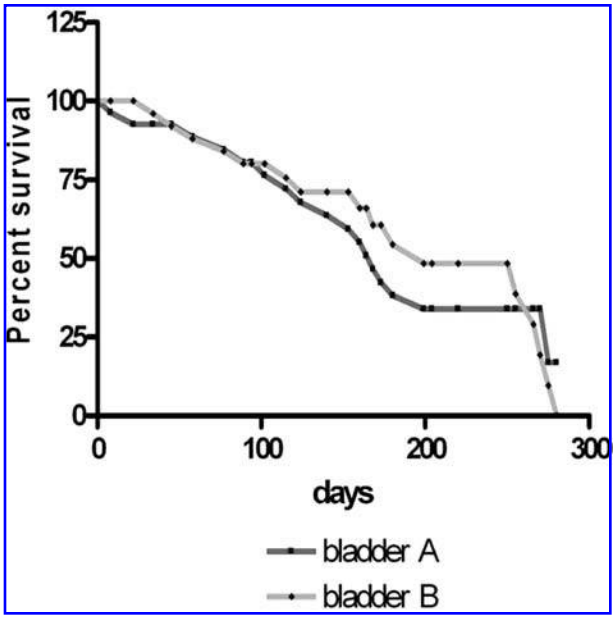

FIG. 1. Survival data for locally extended malignancy (A) and disseminated disease (B) in patients with bladder cancer.

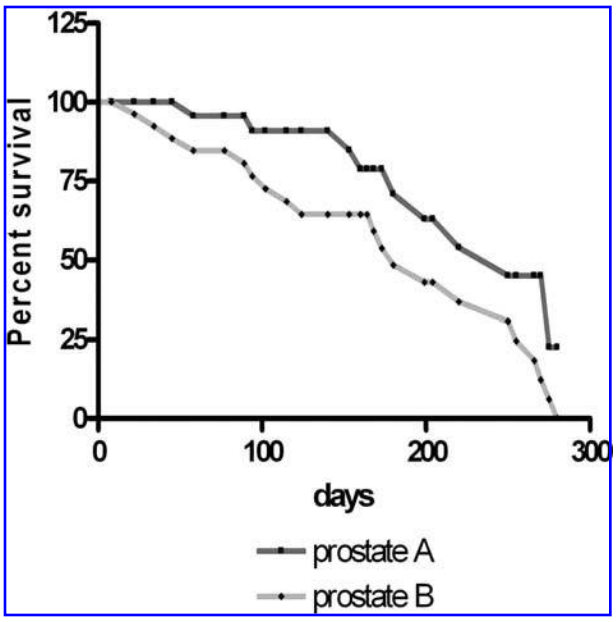

FIG. 2. Survival data for locally extended malignancy (A) and disseminated disease (B) in patients with prostate cancer.

Finally, we assessed the impact of the procedure on QoL by using the EORTC QLC-C30 (version 2.0) questionnaire. This was answered by the patients on two occasions: just before and 1 month after the procedure. On the same occasions, we also checked creatinine levels in all patients and recorded the results.

Statistical analysis was applied between groups divided first by each type of malignancy and, within each type of cancer, by disease extent (subgroups A and B described above). Statistical analysis attempted to identify any statistically important differences in overall survival between subgroups and QoL before and after the procedure. Kaplan-Meier curves of the overall survival were assessed in each group and subgroup and computed using the software program Prism Ver. 4.0. Finally, Mann-Whitney statistical analysis was used for QoL score difference estimation (SPSS, Ver. 12.0 Statistical Package).

Nephrostomy technique

The patient was placed in the full prone position or with the side of planned access slightly elevated (30 degree angle toward the horizontal plane). The physiologic lordosis of the vertebral column was minimized by the placement of a pillow under the abdomen. Percutaneous access was accomplished under local anesthesia (using 10 mL of 2% lidocaine). The access port was established through metal Alken dilators under both ultrasonographic and fluoroscopic guidance.

After selecting the most suitable calyx, initial puncture was made with a 17.5-gauge Chiba needle with removable trocar (usually with a free-hand technique). Then contrast was injected into the collecting system under fluoroscopy to confirm the correct placement of the needle. A 0.035-inch Lunderquist inflexible steel guidewire with flexible tip was then inserted into the collecting system. A series of Alken metal dilators inserted over this guidewire produced a channel of up to 14 to 16F in diam-

eter. Finally, we removed all but the initial dilators; an open-ended silicone Foley catheter was advanced over it into the pelvis and was eventually removed. We usually recommend changing catheters every 3 months, unless circumstances dictate otherwise.

RESULTS

Minor temperature rises because of urinary tract infection were experienced in 55% of patients. A transfusion was needed because of the percutaneous approach for only 8 patients (2.9 %); usually transfusion was necessary because of low hemoglobin levels before the procedure rather than because of the procedure itself. Serious complications that usually accompany percutaneous access to the kidney, such as sepsis, severe bleeding,[2] or injury to adjacent organs,[3] were not experienced with our technique. We initially failed to access the collecting system in 7 patients (2.5 %), mainly because of anatomic difficulties or lack of patient cooperation. In these cases, percutaneous access to the other kidney was attempted, or it was decided to repeat the nephrostomy procedure on the same kidney after a short interval. In 12 patients (4.4%), a second nephrostomy was later performed on the other kidney because of persistent uremia despite successful diversion on the one side.

After the procedure, a considerable improvement in renal function was observed. For the total cohort of patients, the mean serum creatinine concentration before the operation was 6.9 mg/dL ± SD 4.9 and dropped to a mean value of 2.4 mg/dL ± SD 1.5 after the procedure ($P < 0.03$).

Specific survival periods after the procedure are presented in Table 2. As expected, patients with a large tumor burden (subgroup B) had universally poorer prognoses. Comparisons of survival among tumor load subgroups (A, B) within different types of malignancies demonstrated a significant favorable difference for those in subgroup A only in prostatic carcinomas ($P < 0.0365$) as well as colorectal neoplasms ($P < 0.0307$).

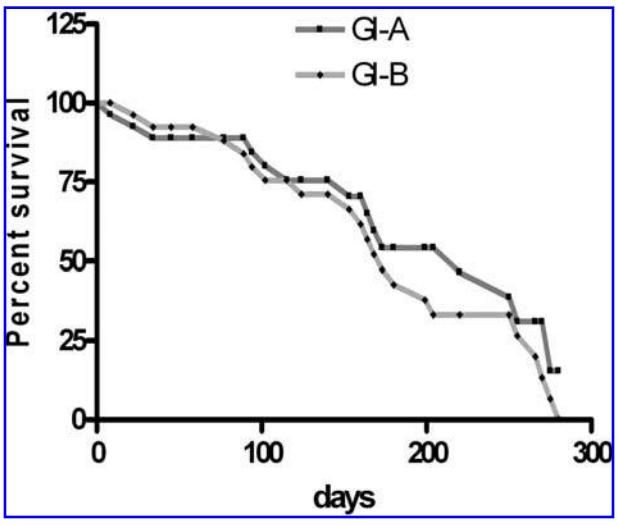

FIG. 3. Survival data for locally extended malignancy (A) and disseminated disease (B) in patients with gynecologic cancer.

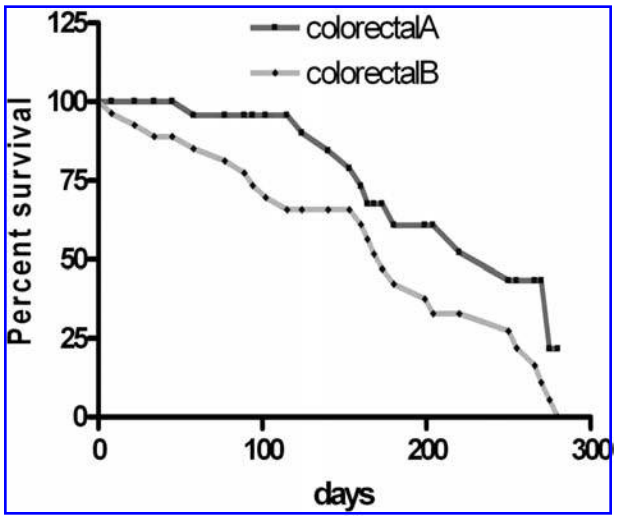

FIG. 4. Survival data for locally extended malignancy (A) and disseminated disease (B) in patients with colorectal cancer.

There were no statistically important survival differences among those in the bladder ($P < 0.4695$), gynecologic ($P < 0.2933$), and other cancers groups ($P < 0.4695$) (Figs. 1–5). Overall, 67% of the patients died from cancer -related causes within 6 months of the procedure.

The overall group QoL score improved slightly within 1 month after the procedure. Again, within each type of malignancy and between different tumor load subgroups, QoL scores did not demonstrate any statistical significant changes, with the exception of those in the prostate cancer group ($P < 0.001$) (Table 3).

DISCUSSION

Generally, ureteral obstruction caused by either pelvic or nonpelvic advanced malignancy is considered a clinical mark of poor prognosis. The onset of poor renal residuals in addition to a usually compromised physical status because of cancer and cancer-related treatments may immediately provoke decisions to relieve the obstruction in almost every case. In earlier years, open surgical placement of nephrostomy tubes for the management of malignant ureteric obstruction was common practice.[4,5] The open procedure was associated with high complication and mortality rates. In contrast, percutaneous nephrostomy has developed into a safe, widely used technique during the last 20 years. In experienced hands, minimal morbidity is produced with percutaneous nephrostomy. In addition, this procedure can be performed under local anesthesia, and it is well tolerated even for patients in whom retrograde stenting is unsuccessful or discouraged.[6,7]

Many investigators have argued that the decision of whether to perform diversion as a palliative method for patients with advanced cancer must be based on tumor stage, individual patient prognosis, the likelihood of cancer responding to salvage treatment, and potential for QoL improvement.[8,9] The knowledge a patient has of suffering aassociated with end-stage disease and other morbidities and with cancer treatment modalities can produce a heavy burden, both physically and psychologically. In this

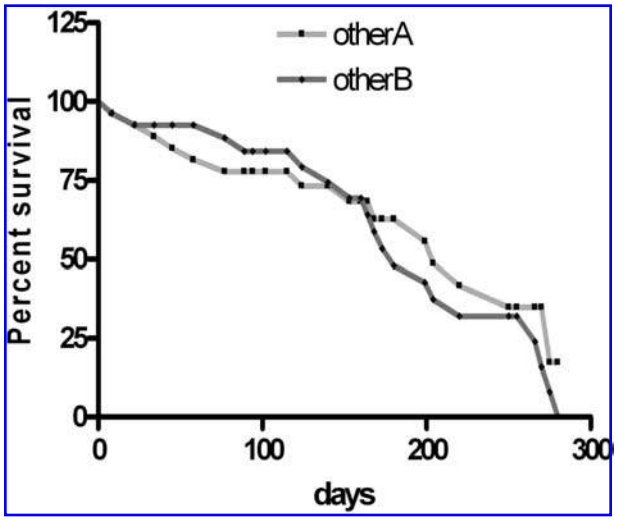

FIG. 5. Survival data for locally extended malignancy (A) and disseminated disease (B) in patients with other types of cancer (gastric, pancreatic, etc).

time of crisis, family members or institutions can work together to decrease suffering. In addition, significant emotional distress may influence the decisions on prolonging life in the hope of better outcome at a later date. Urologists may be called on to help the decision-making process; it is crucial that facts are presented to patient and caregivers in a realistic way.

Previous reports have documented that the achieved prolonged survival that is offered through the relief of renal failure could lead to a course of suffering from the main disease, something the patient may not prefer.[1,6,10] In a majority of advanced neoplasm examples, survival rates are significantly poor even after urinary diversion, especially if largely disseminated or recurrent disease has occurred.[1,5,11–15]

Our decision to use two tumor load subgroups of disease extent throughout the variety of neoplasms in our study was based on the fact that urologic malignancies may be expected to produce severe obstruction earlier or in lower tumor volumes. By defining locally advanced and largely disseminated (including metastatic) disease, we thought that we could avoid this bias and improve the objectivity of our comparisons.

Most of our patients had undergone previous treatment for their disease, including a variety of surgical, radiation, or chemotherapeutic procedures. To avoid any patient numbers biases, we included equal numbers of cases within each malignancy and within subgroups in each malignancy. The low percentage of serious complications in our study may be attributed to the fact that experienced surgeons were the ones to perform access and to the consequent avoidance of multiple punctures.

Our results demonstrate that percutaneous nephrostomy is a safe procedure in experienced hands and does produce statistically important renal function relief. We were able to demonstrate that patients with prostate and colorectal cancers with low tumor burden have significantly longer survival compared with those in the large tumor load subgroup. This finding did not apply to any other types of malignancy.

As expected, in the prostate cancer subgroups, lower tumor burden was often associated with hormone-sensitive prostate carcinomas. Also, for colorectal cancer, favorable outcome in subgroup A may be attributed to the success of salvage treatment in those with lower tumor loads. The anticipation of disease response to salvage manipulation as well as the slower nature of disease progression in these neoplasms may explain this outcome.

In addition, we have also shown that performing percutaneous nephrostomy does not produce any significant improvement in QoL for these patients. This may be expected, because overall performance status is usually poor in these advanced stages of the clinical course. Nephrostomy placement by itself does not affect survival in patients with the majority of can-

TABLE 3. QUALITY OF LIFE STATISTICAL OVERVIEW BEFORE AND AFTER THE NEPHROSTOMY

Malignancy	*Mann-Whitney statistical analysis*	*Before nephrostomy*	*After nephrostomy*
Bladder	Score: 78–107 SD: 7.31 Mean: 94.5185 $P = 0.289$	Score: 78–107	Score: 78–106
Prostate	Score: 69–105 SD: 10.022 Mean: 87.9047 $P < 0.001$	Score: 79–105	Score: 69–102
Gynecological	Score: 71–105 SD: 7.187 Mean: 92.5185 $P = 0.98$	Score: 80–105	Score: 71–104
Colorectal	Score: 76–105 SD: 8.305 Mean: 92.6481 $P = 0.46$	Score: 77–105	Score: 76–104
Others	Score: 69–105 SD: 8.456 Mean: 88.4815 $P = 0.498$	Score: 78–105	Score: 69–103

cers; preserving renal function may offer a highly appreciated opportunity only in cancers that are most likely to respond to ongoing salvage treatment. Therefore, one could argue that, if anticipated successful palliative treatment is excluded, then only QoL status must be the determining factor in justifying the decision for percutaneous urine deviation.

Shekarriz and associates[1] have also concluded that the majority of patients with bilateral ureteric obstruction secondary to malignancy had poor performance status for the remainder of life after diversion. In our study design, we decided not to record performance status but used a QoL questionnaire instead, because we thought that the compromise of physical status was universal in the patients studied. The slight improvement that was seen in QoL scores after diversion may have been neutralized partly because of a new drainage catheter in the body, other coexisting morbidities, and the strong impact of ongoing salvage treatment.

Because percutaneous urinary diversion does usually improve renal function significantly, its minimally invasive characteristics make it inviting to be attempted in every patient with advanced malignancy who presents with obstructive uropathy and renal failure. However, in patients with advanced cancer, as has also been shown by others,[16] the true impact of urinary diversion on survival and QoL is poor, because of the progress of the main disease. Therefore, careful timing of the intervention by the urologist is essential so that patients have the maximum benefit from the procedure. In our experience, without any selective optimal timing of placement of the nephrostomy tube, 67% of our patients died within the first 6 months after the procedure.

In our opinion, application of percutaneous nephrostomy should be individualized[17] rather than be standard for all patients. One could argue as to the true benefit to a patient who receives a few weeks to a few months of survival without any alteration to QoL, disease outcome, or even delay in disease progression, and probably with increased awareness of imminent death.

This decision for or against percutaneous nephrostomy is to be made after careful consultation with the patient and any caregiver involved, especially if the patient is to have longer periods of pain and anxiety. Many persons and patients may share the view that for severe and incurable conditions, the aim should not be the extension of life at any cost, but the guarantee of a decent and acceptable survival for the patient.

CONCLUSION

Percutaneous nephrostomy is a valuable means of preserving renal function in either expected or established obstructive uropathy. However, in the setting of advanced malignancy, one must carefully select the appropriate time of intervention. The minimally invasive characteristics of the method make it tempting to be performed in almost every case, but in a substantial percentage of those who with end-stage disease, little benefit can be anticipated. In our opinion, apart from clear indications, such as in patients in whom effective treatment may be initiated or continued, a consensus must be reached on the timing and value of the procedure in those who probably may not receive significant benefit or experience prolonged survival.

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ABBREVIATIONS USED

QoL = quality of life; SD = Standard deviation.

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