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ORIGINAL PAPER

FACTORS INFLUENCING THE NUMBER OF DIALYSIS SESSIONS ASSOCIATED WITH UROLOGICAL INTERVENTIONS

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Abstract

Introduction. The purpose of the study was to determine whether the following 4 factors: age, sex, type of intervention and type of dialysis (acute or chronic), have an influence on the number of dialysis sessions associated with urological interventions.
Material and methods. The study included almost 3000 patients undergoing dialysis, during a 3 year period, in 3 university hospitals in Bucharest, Romania. In the end, after applying the inclusion and exclusion criteria, the study group consisted of 89 patients. The time frame in which the number of dialysis sessions was evaluated started from the moment the patients entered urological surveillance for undergoing a urological intervention until the patients where discharged.
Results. Out of the 4 factors, the following statistically significant differences were encountered: the mean number of dialysis sessions was lower in patients under 50 years than in those older than 69 years ($p<0,05$, $p=0,02$) and the mean number of dialysis sessions was lower for chronic dialysis than for acute dialysis ($p<0,05$, $p=0.038$).
Conclusions. While the number of elderly patients required more dialysis sessions than the younger patients in association with urological interventions,

Résumé

Facteurs qui influencent le nombre de séances de dialyse associées à des interventions urologiques

Introduction. Le présent article vise à quel point le nombre d'hémodialyses associé à la chirurgie urologique est influencé par l'un des quatre paramètres: l'âge du patient, le sexe du patient, le type d'hémodialyse (aiguë ou chronique) et le type de chirurgie urologique.
Matériel et méthode. L'étude a inclus 3000 patients subissant l'hémodialyse pour 3 ans en 3 grands hôpitaux à Bucarest, Roumanie. Après avoir appliqué les critères d'inclusion et d'exclusion, le groupe d'étude final comptait 89 patients. La période d'étude concernant le nombre de dialyse s'est étendue entre 7-1 jours en pré-opératoire jusqu'au moment de sortie de l'hopital (1-30 jours en post-opératoire)
Résultats. Parrmi les 4 facteurs, les différences statistiquement significatives suivantes ont été rencontrées: le nombre moyen de séances de dialyse était inférieur chez les patients de moins de 50 ans que chez ceux de plus de 69 ans ($p <0,05$, $p = 0,02$) et le nombre moyen de séances de dialyse était plus faible pour la dialyse chronique que pour la dialyse aiguë ($p <0,05$,

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there were no significant differences regarding the sex of the patient. Although there were no significant differences regarding the type of urological interventions, the acute onset of the renal insufficiency associated with acute dialysis required a larger number of dialysis sessions than the patients already on chronic dialysis at the time of surgery.

Keywords: hemodialysis, sessions, urological interventions.

p = 0,038). **Conclusions.** Alors que les patients âgés (plus de 69 ans) nécessitaient en moyenne plus de dialyses que les sujets plus jeunes (moins de 50 ans), le nombre de séances de dialyse n'était pas influencé par le sexe du patient. Bien qu'il n'y ait pas de différences dans le nombre de séances de dialyse par rapport au type de chirurgie, le caractère aigu de l'insuffisance rénale impose un plus grand nombre de séances de dialyse que celui des patients chroniquement dialysés au moment de la chirurgie.

Mots-clés: hémodialyse, séances, interventions urologiques.

Introduction

There is a paucity of published studies in the literature regarding the study of urological interventions in patients undergoing dialysis[1-5].

Unfortunately, the information related to this topic is limited to a few data in the context of larger studies and not at all to a more complete and centered approach to this type of patients[6-10].

The objective of this study was to determine whether the number of dialysis sessions associated with urological interventions is influenced by the following 4 factors: age, sex, type of urological intervention and the type of dialysis used (acute or chronic)[11].

Material and methods

Out of the 2846 patients undergoing dialysis for a period of 3 years, in 3 university hospitals in Bucharest, Romania (Emergency University Hospital, „Sf. Ioan" Emergency Clinical Hospital, and „Prof. Dr. Theodor Burghele" Urology Hospital), after applying the inclusion and exclusion criteria, the final study group consisted of 89 patients.

The time frame in which the number of dialysis sessions was evaluated was centered on the urological intervention and started from the moment when the patients entered urological surveillance for undergoing a urological intervention (between preoperative day 7 and 1) until the patients where discharged (between postoperative day 1 and 30).

This study is a retrospective observational study.

Inclusion criteria:

– Patients undergoing chronic dialysis (defined as patients on dialysis program for more than 90 days prior to the surgical intervention) and patients undergoing acute dialysis (defined as patients in which dialysis was initiated 7 days prior or 7 days after the surgical intervention) that underwent concomitant urological intervention (endoscopic, open or laparoscopic) during the considered period of time[12-15].

Exclusion criteria:

– Patients on peritoneal dialysis.
– Patients in which dialysis was initiated in the 7 to 90 days prior to the urological intervention.
– Patients with dialysis-associated complications (infection, thrombosis of the arteriovenous fistula, obstruction of the central venous catheter, etc.)[16-19].
– Patients with urological interventions other than those for urinary lithiasis and upper or lower urinary tract neoplasia.

Regarding the number of dialysis sessions associated with urological interventions, this paper proposes the following hypothesis:

1) if open urological interventions (which in theory are more complex) require a longer time for recovery and hospitalization required more dialysis sessions compared to endoscopic urological interventions?
2) if endoscopic urological interventions for the upper urinary tract required more dialysis sessions compared to lower urinary tract?
3) if bilateral endoscopic urological interventions required more dialysis sessions compared to unilateral interventions?
4) if the number of dialysis sessions can be quantified for each type of urological intervention?

This paper does not address the complications associated directly to the surgical interventions or the dialysis process itself.

The data used in this study were cleansed and validated. Descriptive and inferential statistics were obtained using IBM software, SPSS v.22.0.

Results

Out of the 89 patients enrolled in the study, 32 patients were female and 57 were male patients. Approximately 13% of the patients were under 50

years of age, 40% had ages between 50 and 69 years old and 46% were older than 69 years.

The most common diagnoses in the study group were: ureterohydronephrosis (81% of patients), followed by neoplasia of the urinary tract (60% of patients) and obstructive anuria (51% of patients). The number of patients who required acute dialysis (60 patients) was double than the number of patients on chronic dialysis (29) at the time of the intervention.

All the patients enrolled in the study underwent a urological intervention, and some of them had several interventions (both open and endoscopic), performed during their hospitalization time.

As much as 48% of the patients required only 1 session of hemodialysis; 30% required 2 sessions and 12% required 3 sessions of dialysis during the hospitalization time. The maximum number of dialysis sessions per patients was 10. In other words, approximately 90% of the patients required up to 3 sessions and less than 5% of the patients required more than 5 sessions of dialysis in relation to the urological interventions. We can conclude that the large majority of patients in the study group needed only a small number of dialysis sessions during their hospitalization.

Regarding the number of dialysis sessions related to the **sex** of the patient, 87.5% of the women and 91.2% of the men required up to 3 dialysis sessions, out of which, around 50% (53% women and 45.6% men) required only 1 dialysis session during the followed time frame. Although there were differences between the mean number of dialysis sessions of the female (1.95 dialysis sessions) versus male patients (2.0 dialysis sessions), this difference is not statistically significant (p=0.869, p>0.05). In conclusion, we can state that the sex of the patient did not influence the number of dialysis sessions in our study group.

Regarding the number of dialysis sessions related to the **age** of the patient, 75% of the patients under 50 years old associated only 1 session of dialysis and the rest of the patients under this age associated maximum 2 sessions of dialysis. On the other hand, the number of patients with more than 2 dialysis sessions was larger in the contiguous age group category of over 69 years than those in the age group between 50 and 69 years.

Although the mean number of sessions was different in the age group category of over 69 (2.27 sessions of dialysis) versus those in the age group between 50 and 69 years (1.86 sessions) the difference is not statistically significant (p=0.238, p>0.05).

Nevertheless, age is relevant when comparing the distant age group categories. Statistical analysis shows a significantly lower number of dialysis sessions in

Table 1. The number of dialysis sessions related to the type of surgical intervention.

Type of intervention	*Total number of interventions*	*Mean*	*Minimum*	*Maximum*	*Total number of dialysis sessions*
Nephrostomy unilateral	28	1.86	1	5	52
Ureteroscopy unilateral	19	2.2	1	10	42
Ureteral stent unilateral	15	2.33	1	10	35
Transurethral resection of bladder tumor (TURBT)	14	2.50	1	5	35
Cystoscopy	14	1.79	1	5	25
Nephrostomy bilateral	10	1.50	1	2	15
Nephrectomy (open)	9	2.67	1	7	24
Ureteral stent bilateral	9	2.44	1	7	22
Endoscopic urethrotomy	5	2.80	1	5	14
Transurethral resection of prostate (TURP)	5	2.60	1	4	13
Ureteroscopy bilateral	5	2	1	3	10
Orchiectomy unilateral	4	1.50	1	2	6
Transvesical cistolithotomy	2	2.00	1	3	4
Nephroureterectomy	1	2.00	2	2	2
Orchiectomy bilateral	1	2.00	2	2	2
Transvesical prostatectomy	1	1.00	1	1	1
Ureteral fibroepithelial polyp excision	1	1.00	1	1	1
Endoscopic insertion of urethrovesical (UV) catheter	1	1.00	1	1	1

Data source: data collected by the author.

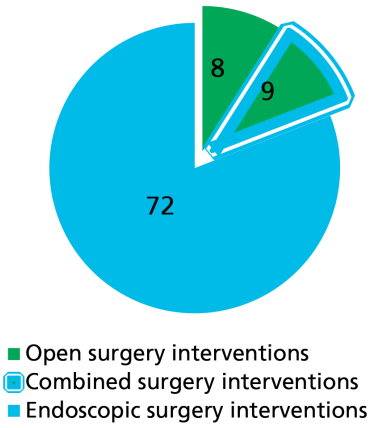

Fig. 1. Patient distribution according to the type of urological intervention (open versus endoscopic).

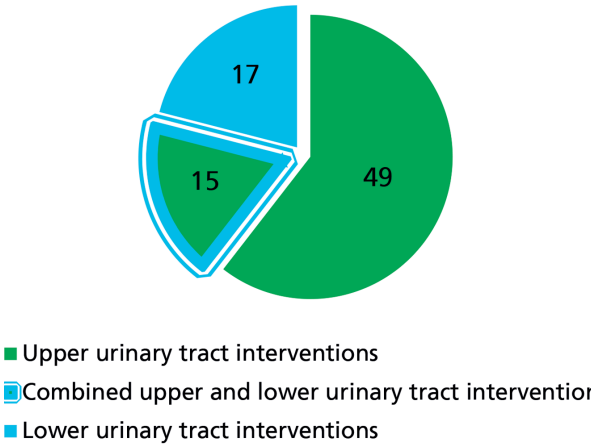

Fig. 2. Patients distribution according to the type of endoscopic urological intervention (upper urinary tract versus lower urinary tract).

younger patients (under 50 years) than older patients of over 69 years ($p<0.05$, $p=0.02$).

In conclusion, although there were no significant differences between the number of dialysis sessions in the contiguous age groups, there were significant differences in the distant age groups (the older patients required a greater number of dialysis patients than the young ones).

As to the **type of dialysis** used, patients undergoing chronic dialysis required a mean of 1.59 sessions versus 2.15 sessions in the acute dialysis group. This difference is statistically significant ($p<0.05$, $p=0.038$). In conclusion, we can state that the acute onset of dialysis demanded a larger number of dialysis sessions in patients undergoing urological interventions.

Regarding the total number of dialysis sessions shown in table 1, the first 6 out of 18 interventions with the highest number of dialysis are all endoscopic procedures. Surprisingly, the largest mean number of dialysis sessions was related to endoscopic urethrotomy (2.8 sessions) followed by open nephrectomy (2.67 sessions) and TURP (2.6 sessions).

The mean number of dialysis sessions associated with endoscopic interventions (1.93 sessions) was larger than in open interventions (1.88 sessions). This difference is not statistically significant ($p>0.05$, $p=0.88$). Out of the analysis, a number of 9 patients with concomitant open and endoscopic surgery was excluded (Fig. 1). In conclusion, we can state that there were no differences in the number of dialysis sessions between open and endoscopic surgery in our study group.

Following the second hypothesis, 49 patients had upper urinary tract endoscopic procedures (nephrostomy, ureteral stent placement and ureteroscopy) and

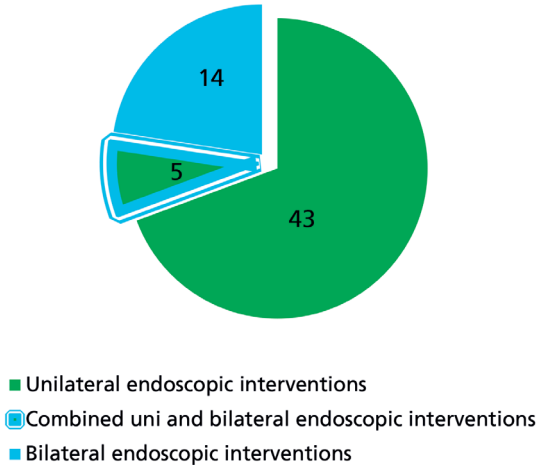

Fig. 3. Patients' distribution according to the type of endoscopic urological intervention (unilateral versus bilateral).

17 patients had lower urinary tract interventions (urethrotomy, TURP, TURBT, cystoscopy and endoscopic insertion of urethrovesical catheter).

Upper urinary tract interventions associated a mean of 1.94 sessions of dialysis versus 1.82 sessions for the lower urinary tract. This difference is not statistically significant ($p>0.05$, $p=0.7$). Out of the analysis, a number of 15 patients with concomitant upper and lower urinary tract interventions were excluded (Fig. 2). In conclusion, we can state that there were no differences in the number of dialysis sessions between the two types of procedures.

For the third hypothesis, 43 patients had unilateral endoscopic procedures (nephrostomy, ureteral stent placement, and ureteroscopy) versus 14 patients with bilateral endoscopic procedures.

The mean number of dialysis sessions associated with endoscopic bilateral interventions (2.07 sessions) was larger than in unilateral endoscopic interventions (2.02 sessions). This difference is not statistically significant ($p>0.05$, $p=0.91$). A number of 5 patients with concomitant interventions more than 2 days apart from each other were excluded from the analysis (Fig. 3). In conclusion, we can state that there were no differences in the number of dialysis sessions between unilateral and bilateral endoscopic interventions in our study group.

Finally, in theory, we can link each type of intervention to a mean number of dialysis sessions in our study group (as shown in Table 1). Regarding a few types of intervention, there was a large difference between the minimum and the maximum number of sessions per intervention (unilateral ureteroscopy – a difference of 9 sessions, nephrectomy and bilateral ureteral stent placement – a difference of 6 sessions) and this great variability regarding these numbers should be taken into consideration when interpreting these results.

Discussion and conclusions

Age had an influence on the number of dialysis sessions associated with urological interventions, with older patients (over 69 years) requiring more sessions than the young patients (under 50 years) while the sex of the patients was not an influencing factor in this study[20,21].

After analyzing the study group, we can state that, overall, urological interventions are associated with a small number of dialysis sessions. More than that, we can conclude that the type of intervention (open versus endoscopic, upper urinary tract versus lower urinary tract and unilateral endoscopic versus bilateral endoscopic procedures) did not influence the number of dialysis sessions.

Contrary to the type of intervention, the acute character of the renal insufficiency and consecutively the acute type of dialysis required a greater number of dialysis sessions until discharge than the patients already on chronic dialysis at the time of intervention.

Although we can theoretically attribute a specific number of dialysis sessions to each type of urological intervention, the great variability regarding these numbers should be taken into consideration when interpreting these results. This type of quantification can, in the future, help practitioners to estimate the postoperative dialysis algorithm, give a perspective on the overall hospitalization period of each patient, estimate the materials necessary and related costs and it could even influence the type of procedure selected for each specific patient[22,23].

The data used in this study was obtained as a result of the collaboration between urologists and nephrologists working in the hospitals mentioned above and this confirms the fact that multidisciplinary teams are needed in order to adequately treat this type of patients.

Finally, when interpreting the results published in this paper we should have in mind the limitations of the study, such as intra- and postoperative complications of the urological intervention/ns, patient comorbidities, fluid absorption during endoscopic interventions, etc[24-28].

In conclusion, although some factors have influenced the number of dialysis sessions required for the patients in our study group, the exact extent in which these results can be applied to the larger population of dialysis patients undergoing surgical interventions should be the object of larger, multicentric studies.

Compliance with Ethics Requirements:

„The authors declare no conflict of interest regarding this article"

„The authors declare that all the procedures and experiments of this study respect the ethical standards in the Helsinki Declaration of 1975, as revised in 2008(5), as well as the national law. Informed consent was obtained from all the patients included in the study"

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