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LETTER TO THE EDITOR

Which efficiency index for urinary stones treatment?

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Abstract Clinical results in urinary stones management are often reported using the stone-free (SF) rate, which is simple, reproducible and useful to compare techniques or centers. But this index does not take into account costs or patients' quality of life. In a way, SF "pursuit", which cannot be considered as a universal therapeutic goal could increase costs and decrease patients' comfort. We retrospectively reviewed files of stone management to describe costs according to several items and we emphasize the need for a true efficiency index.

Keywords Urolithiasis · Economics · Medical · Evaluation · Quality of life · Quality indicators · Health care

Introduction

Urolithiasis is a common condition, most of the times presenting as an acute renal colic. According to Saigal [1], more than 1% of working adults were treated for urinary calculus in USA in 2000 for a mean cost of $3494 per patient. Urolithiasis costs have been estimated at almost $2 billions annually [2]. Many techniques have been proposed for urinary stones management and, for a same stone position and size, several competing techniques of various prices can be found. Consequently, quantifying clinical results is of critical importance in this non life-threatening disease. Stone-free (SF) rate is the easiest and the most known index for clinical results. It is defined as the rate of patients from whom no residual stone fragment is seen on imaging controls. However, is it also the most accurate way to calculate efficiency?

Methods

We retrospectively reviewed, the first 6 months of 2007 in our Department, the files of patients who had needed extracorporeal shockwave lithotripsy, endoscopy or surgery for urinary stone ablation or fragmentation. Collected data included:

- Billing costs for operative care (OR) (according to French medical refund system)
- Billing costs for hospital stays
- Number of hospital stays
- Sum of in-hospital days
- Clinical results, evaluated by the SF rate at 6 months. Patients with residual fragments were stratified in two groups: one without symptom and the other with symptoms.
- Profitability per day was defined as the sum of billing costs divided by the sum of in-hospital days

We performed analysis using Microsoft Excel software. Means were compared by the bilateral Student's t test, with an alpha risk of 0.05.

Results

Data were obtained for 46 patients and are summarized in Tables 1, 2, 3.

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Table 1 Stratification according to results

Status	*N*	Stone mean size (mm)	OR billing costs (€)	Hospital billing costs (€)
Lost to follow-up	5	16.80	802.51	5307.68
Fragments, no symptom	15	13.87	889.76	4902.18
Fragments, symptoms	3	20.67	747.40	4153.44
Stone-free	23	10.17	562.11	3010.27

p = NS

Table 2 Stratification according to the number of stays

Number of stays	*N*	% emergency recruitment	Stone mean size (mm)	OR billing costs (€)	Hospital billing costs (€)	% SF	Profitability per day (€/d)
>2	9	55.56	15.56	1291.25*	7562.09*	14.29*	895.28
2	13	84.62	10.61	606.72*	3739.58*	72.73	807.17
1	24	12.50*	12.92	502.73	2513.66*	60.87	872.21

*$p < 0.05$

SF stone-free

Table 3 Stratification according to stone size

Stone size (mm)	*N*	Mean number of stays	OR billing costs (€)	Hospital billing costs (€)	% SF	Profitability per day (€/d)
<10	18	1.56	539.96	3160.82	76.47	1074.42
10–20	18	1.94	543.45	3156.20	50	924.91
>19	10	2.50	1207.29*	6329.47*	25	697.85

*$p < 0.05$

Billing costs appear independent from SF status. Stone-free patients have lower costs, but in a non-significant way ($p = 0.07$) (Table 1). Quite logically, costs increase with the number of stays. Yet, increase in the number of stays does not lead to better results: beyond two stays, incremental in SF status is minimal (Table 2). Costs seem to depend on the stone size when above 19 mm, but increase in costs does not afford a better profitability per day (Table 3).

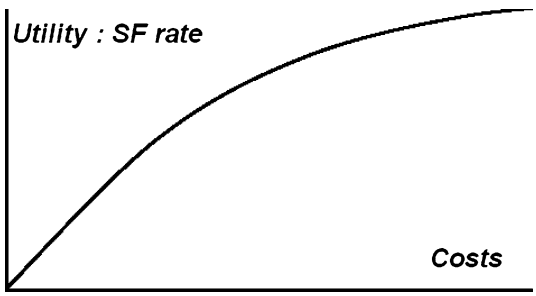

Fig. 1 SF rate as an utility function

Discussion

There is a risk of a non-linear relationship between costs and SF status, following the well-known economics model of "decreasing marginal profitability" in utility curve (Fig. 1).

SF rate is the most reproducible and accurate index to compare results from different centers, but is questionable as an individual therapeutic goal. Several studies have indeed shown that one out of four patients with residual fragments needed complementary procedures [3–5]. As retreatment or ancillary procedures such as ureteral stenting may be needed, an efficacy quotient (EQ) has been developed and defined as follows [6]:

$$\frac{\text{SF rate } (\%)}{100 + \text{retreatment rate} + \text{ancillary procedures rate}}$$

However, EQ does not take costs into account. Chandhoke has developed a cost-efficacy index, which defines the mean cost necessary to turn a patient with staghorn calculus into an SF-patient [7]. He thus demonstrated that stone management with percutaneous

nephrolithotomy is more efficient than without. Still, one limit to theses indexes is that they ignore the patient's discomfort. In this matter, patient's aims are probably at first, to be painless, second, not to risk renal function alteration and finally not to be exposed to pain recurrence. However, stone management, even "minimally invasive" —called techniques, is far from being harmless as to renal function [8, 9] and is sometimes symptomatic for patients. Stone-free cannot be pursued despite patients' "quality of life" which is a subjective and difficult to quantify datum [10–12].

Finally, we do need a new index, which would be proportional to SF rate and quality of life measurement [13] and inversely proportional to the management costs weighted by procedures' number.

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