

## ESTIMATION OF TOTAL NUMBER OF EPITHELIAL CELLS ON THE SURFACE OF HYDROPHILIC CATHETERS USED FOR INTERMITTENT URINARY BLADDER CATHETERIZATION BY USE OF FRACTIONATOR METHOD

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### ABSTRACT

The total number of cells on catheters used for intermittent urinary bladder catheterization is an indicator of the mucosal lesion made by the catheters. Therefore we designed a method for unbiased estimation of the total cell number on catheters based on the stereological fractionator principle and systematic sampling. The method was used on two different types of hydrophilic catheters, on which the same number of cells was found.

**Key words:** stereology, fractionator, total cell number, intermittent catheterization.

### INTRODUCTION

Intermittent catheterization (IC) is a result of innovative ideas which have been prevalent in the medical health and psycho-social life of spinal cord injured patients during the past 40 years (McGuire and Savastano, 1983). Long-term follow ups of the IC method have stated that urethral complications with infections and fibrosis are dependent on the length of the regimen and it is shown that hydrophilic catheters used for IC seem to cause less short-term and long-term trauma (Waller et al., 1995).

For investigation of the physical properties of the catheters an unbiased estimator of the total number of cells on the surface of the catheters is useful, because this number is parallel to the adhesive property - and thereby parallel to the traumatic property of the catheters. Based on the stereological fractionator method (Gundersen et al., 1988) we designed a method of cutting the catheters in pieces by systematic sampling (Gundersen and Jensen, 1987) and of counting the cells on the surface of the catheters after hematoxylin-eosin staining.

### MATERIAL

Twenty spinal cord injured patients using IC were in 2 consecutive 24 hours periods using either Lofric or Easicath for all their catheterizations. Which catheter they used first was determined by randomization. The catheter used for the last catheterization in each 24 hour period was placed in 4 per cent formalin without contact to the wall of the fixation jar.

## METHOD

After fixation each catheter was divided into pieces with a length of 5 centimeters, where the first piece from the tip of the catheter had a random length from 0 to 5 centimeters. From each of these pieces a piece of catheter with a length of 5 millimeter was taken from the tip end. All the 5 millimeter pieces were stained by a hematoxylin-eosin method, and the surface of all the pieces was subject to microscopy; counting the total number of cells on the pieces. This number multiplied by 10 is an unbiased estimate of the total number of cells on the surface of the catheter.

## RESULTS

The total number of cells on the surface of the catheters is shown in Table 1, which also shows the sex and duration of the spinal cord injury. The number of cells varies from 30 to more than 10,000 with no difference between the two types of catheter ( $p = 0.97$  using a paired Willcoxon-Pratt test). In general, a high number of cells on one type of catheter indicates high number of cells on the other type of catheter and vice versa. There was no correlation between cell number and duration of the spinal cord injury, but there was an (insignificant) tendency to more cells on catheters from women.

Table 1. The table shows the patients ranked according to the total number of cells on the catheters.

patient no.	number of cells on catheters		sex	months of injury		
	Lofric	EasiCath		1 - 4	5 - 12	over 12
5	110	30	male	+		
20	110	70	male	+		
11	40	270	male		+	
4	170	250	male		+	
3	320	260	male			+
2	220	430	male		+	
1	210	650	male	+		
8	80	over 1,000	male	+		
13	550	950	female			+
9	over 1,300	380	male		+	
10	over 1,000	over 1,000	male			+
16	830	over 1,310	male	+		
14	1550	over 1,100	male	+		
19	over 2,210	440	male	+		
12	over 1,800	over 1,700	female		+	
7	over 2,000	over 2,500	female		+	
15	2,050	over 2,700	female	+		
6	over 2,500	over 2,500	female		+	
17	over 4,000	over 2,230	male			+
18	over 10,000	over 3,650	female			+

## DISCUSSION

The development of clinical routines in the treatment and care of patients with spinal cord injury has often taken place without scientifically based prospective comparisons between new and old (established) methods. New methods have to prove that they are more effective, safer and economically viable. Clinical trials are increasingly required for comparisons before extensive reorganisations of important routines are carried out. The evaluation of the clinical trials must be based on unbiased, reproducible methods (Waller et al., 1997). The stereological methods fulfil the demand of unbiasedness and reproducibility.

In this paper a method for unbiased, reproducible estimation of the total number of cells on surfaces of catheters is given and the method was used in a study of mucosal trauma made by two types of hydrophilic catheters used for IC showing no difference in number of cells indicating no difference in mucosal lesions made by the catheters.

## CONCLUSION

An unbiased, reproducible stereological method based on the fractionator technique and systematic sampling is designed for estimation of the total number of cells on surfaces of catheters. The method was used to investigate mucosal lesion made by two types of hydrophilic catheters used for intermittent catheterization. The investigation indicates no difference between the catheters.

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