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# THE REVERSIBILITY OF CATHETER-ASSOCIATED POLYPOID CYSTITIS

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ABSTRACT

Cystoscopic and histologic evidence of polypoid cystitis was recorded in 20 hospitalized patients with indwelling w·ethral catheters followed by cystoscopy, biopsies and repeated urine samples before and after catheter removal. The majority of the lesions were located in the posterior wall o1· dome. The lesions disappeared after removal of the catheter in 13 of the 15 patients followed for up to 28 weeks despite pel'Sistent bacteriuria. Polypoid cystitis still 1·emained 28 weeks after cathetel' removal in 1 patient. The lesion is important as a diffe1·ential diagnosis to bladder tumor. The importance of adequate biopsies is emphasized.

Indwelling permanent w·ethral catheters &·e associated with several complications, such as hematuria, bacteriuria, urinary tract infections and mechanical lesions of the bladder mucosa.'In a previous autopsy study a charactuistic lesion of the bladder mucosa was demonstrated in 80 per cent of the patients treated with indwelling permanent catheters.& The predominant location was the postel'ior wall and donie of the bladder. This lesion was labeled polypoid cystitis. 1Iistologi·caUy, similar mucosal changes have been described as bullous cystitis and papillary cystitis.[7,8] From the autopsy study it was not possible to determine whether the bladder mucosa with polypoid cystitis could revert to nonnal if the catheter was removed nor could a possible relationship to urinary tract infection be determined. These issues are studied further herein.

## MATERIAL AND METHODS

Tho study included initially 20 hospitalized geriatric patients (11men and 9 women) with indwelling urethral catheters. Mean patient age was 79 years, with a range of 71 to 89 years (see table).

The patients had been confined to catheter treatment between 1 and 150 months before entering the study. Urinat·y diversion via a urethl'al catheter was indicated by tll'inary retention in 6 patients and by incontinence in 11, associated with acute somatic iJ.!n,ess, such as stroke or myocardial infarc·tion, in the majority of cases. '1\vo patients had received the catheters because of heavy *nursing* and another in connection with amputation below the knee.

Upon entrance into the study the catheter was removed without previous bladder drill. The patients underwent cystoscopy, including forceps biopsies of grossly abnormal a:reas. One portion of the biopsy specimen was prepared for histopathological examination and the remaining portion for bacterial culture. Cystoscopy and biopsies were repeated after 5, 10 and 28 weeks or until the lesion had disappeared grossly and histopathologically in 14 patients, and 1 patient was followed for 10 weeks when she demanded reinsertion of the catheter. These patients did not receive treatment with antibiotics during followup. Five patients could not be followed: *8* had urosepsis, and *2* refused further cooperation and demanded reinsertion of the catheter.

Residual urine volumes were measured weekly for 3 weeks in aU patients or when indicated. *H* the residual urine was >100 cc in i:i.3 instances the patients received carbaminoylcholine chloride. '1\vo patients with urinary incontinence received emiprombromid. All patients underwent bladder drill. Bladder capacity was measured during cystoscopy.

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Ul'ine pies were obtained through the catheter the day before and the day of its removal. Voided samples were obtained on days 1 to 3 and 7, and then weekly for 2 months and then monthly until the bladder mucosa had a normal appe&rance. Bacteriological cultures of urine and biopsy material were obtained using standard media, including aerobic and anaerobic blood aga:r plates. Urine samples were diluted sel'ially IUld plated. The bacteria were identified with biochemical tests'·[10] and also with serological methods for Escherichia coli and Proteus.[11] The sensitivity to antibiotics was tested with the disk diffusion method.[13] Nosocomial types of bacteria were defined as described previously.[14]

The biopsy specimens were fLXed in 4 per cent buffered neutral fonnalin solution and embedded in paraffin. Sections of 5 *J.llll·* were stained with hematoxylin and eosin, and van Gieson's stain. The chi-square test with Yate's correction was used for statistical calculations.

## RESULTS

Cystoscopic and histological evidence of polypoid cystitis was recorded in all20 patients at the initial examination. The lesions were located in the posterior wall or dome in 18 patients and in the anterior wall in *2*. The macroscopic appearance was that of multiple reddened, elevated and polypoid or bullous areas of the bladder mucosa (fig. 1). The ayerage size of the involved &·ea was about 2 cm.$^2$ but even·areas E;:5 cm.$^2$ were found. Histologically, the lesion involved the superficial portion of the bladder wall and elC.bibited dark, sometimes slightly hyperplastic urothelium with scattered neutrophUs often forming mi·croabscesses. The m·othelium appeared degenerative, with focal areas of necrosis often located superficially but sometimes resulting in ulcexations (fig. 2, A). Erythrocytes often were present in the urothelium as well as in the lamina propria, possibly as a result of extravasation and/or ul.ceration (fig. 2, B). The lamina propria was edematous, with an increased number of engorged·dilated vessels. The inflammatory inftltrat.e was dominated by lymphocytes but plasma cells and occasional neutrophils also were present. Moderately severe fibrosis was seen in 8 patients, especially in the deeper parts of the lamina propria. The features of polypoid cystitis were consistent but the severity of the different components discussed previously varied. Severe chronic polypoid cystitis with marked fibrosis of the lamina propria was found in 4 of 8 patients who had bad a catheter for >6 months And in 3 of 12 with a shorter exposure. Removal of the cathetex resulted in the disappearance of poly·poid cystitis in 13 of the 15 patients followed for 5 weeks (fig. 3). 1'he lesion had disappeared within 6 weeks in 8 patients, within 10 weeks in 2 and within 28 weeks in 3. The polypoid

*Pertinent data of 20 patients with catheter-associated polypoid cystitis*

| pt.-Age-Sex No | Duration of Catheter Treatment (mos.) | Reason for Catheter Treatment | Biopsy | | | | Reason for Incomplete Followup |
|---|---|---|---|---|---|---|---|
| | | | ·DayO | 5 Wka. | 10 \Vka. | 28\Vks. | |
| t-71-M | 3.5 | Urinary incontinence | Polypoid cystitis, posterior and later. walls | | | | Urosepsis |
| 2-73-F | 3 | Urinary incontinence | Polypoid C)'31itis, dome | Unchanged | Unchanged | Unchanged' | |
| S-86-F | ·( | Amputation below the knee | Polypoid cystitis, posterior wall | Unchanged | Unchanged | | |
| .(-82— M | 2 | Urinary incontinence | Polypoid cystitis, posterior wall | Minimal changes | Heeled | | |
| 5-73-M | | Urinary Incontinence | Polypoid cystitis, posterior wall | Healed | | | |
| 6-76-M | 4 | Urinary incontinence | Polypoid cystitis, posterior and later. walls | Unchanged | Mild changes | Healed | |
| 7-84— M | 2 | Urinary retention | Polypoid cystitis, dome | HMied | | | |
| 8-85-F | | Urinary retention | Polypoid cystitis, anterior wall | Mild changes | Healed | | |
| 9-76-M | 2 | Urinary incontinence | Polypoid cystitis, posterior wall | | | | Urosepsis |
| lQ-75-F | | Urinary retention | Polypoid cystitis, posterior wall | Healed | | | |
| 11-81-F | 2.6 | Urinary retention | Polypoid cystitis, anterior wall | Healed | | | |
| 12-83-F | | Urinary incontinence | Polypoid cystitis, dome | Healed | | | |
| 13-75-M | 27 | Urinary incontinence | Polypoid cystitis, dome | Healed | | | |
| 14-76-F | 64 | Urinary incontinence | Polypoid cystitis, dome and trigone | | | | Refused cooperation, demanded catheter |
| 15— 74-M | GG | Walking difficulty | Polypoid cystitis, posterior wall, dome | Unchanged | Unchanged | Healed | |
| 16-83-F | 60 | Urinary incontinence | Polypoid cystitis, anterior wall and dome | Healed | | | |
| 17-88-M | 150 | Urinary incontinence | Polypoid cystitis, dome | | | | Refused cooperation, demanded catheter |
| 18-89-M | 72 | Difficult to nurse | Polypoid cystitis, posterior wall | Healed | | | |
| 19-84-M | 9 | Urinary incontinence | Polypoid cystitis, dome | | | | Urosepsis |
| 20-14-F | 10 | Urinary incontinence | Polypoid cystitis, dome | Unchanged | Unchanged | Healed | |

• Died of cardiac anest after 6 months. Autopsy revealed severe Polypoid cystitis.

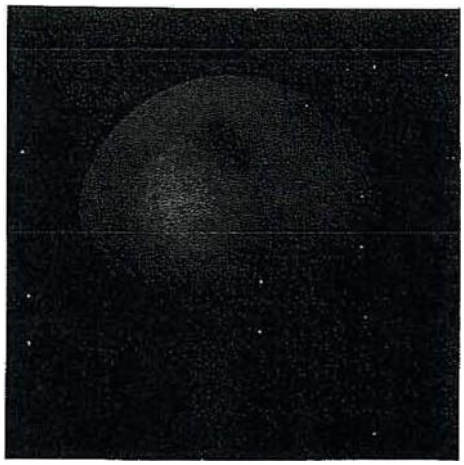
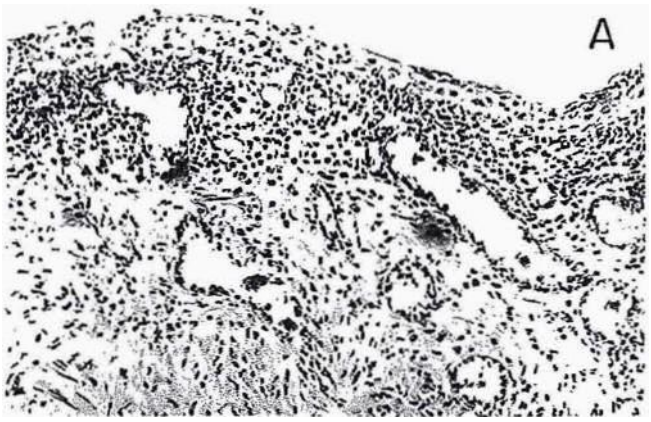


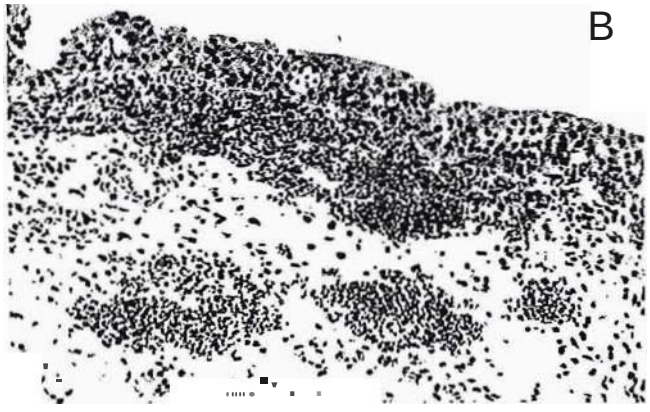
FIG. 1. Cystoscopic appearance of polypoid cystitis in posterior wall of bladder.

cystitis disappeared within 5 weeks in 5 of 10 patients who had been treated with catheterization for <6 months and in 3 of 5 who had had the catheter for >6 months. In 2 patients polypoid cystitis remained after 10 weeks and 6 months, respectively. Patient 2 had persistent large residual urine volumes and urinary tract infection, and died of cardiac arrest after 6 months. Autopsy revealed severe polypoid cystitis with advanced fibrosis of the bladder wall. Patient 3 had severe incontinence and demanded to have a catheter reinserted after 10 weeks.

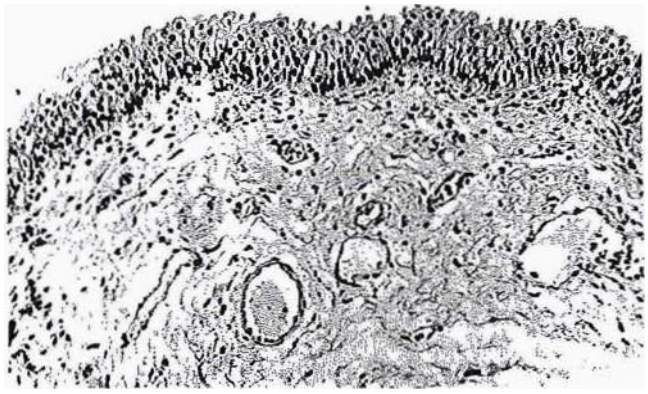
Of the 20 patients 19 had significant bacteriuria, that is $6:10^6$ bacteria per ml. at the beginning of the study, 13 of which were polymicrobic (2 bacterial species). The isolates consisted mainly of E. coli, Klebsiella, Enterobacter, Proteus, Pseudomonas, st-aphylococci and enterococci. No anaerobic bacteria were found. Bacterial cultures were performed on biopsy material from 18 of the 20 patients at the initial cystoscopy. Of these samples 15 showed bacterial growth, each with the same bacterial species as found in the urinary samples obtained at the same time. There were 31 bacterial strains isolated at the start of the investigation, 14 of which were of probable nosocomial type. A total of 19 strains could be isolated 5 weeks later and of these only 5 were of probable nosocomial type. The difference in the number of bacterial strains, including probable nosocomial types during catheter treatment and after removal of the catheter, was not statistically significant. No change in the bacterial flora was found by biochemical and serological tests during followup.

Removal of the indwelling catheter was not completely without clinical problems. Two patients demanded to have the catheter reinserted immediately and 1 after 10 weeks. Three



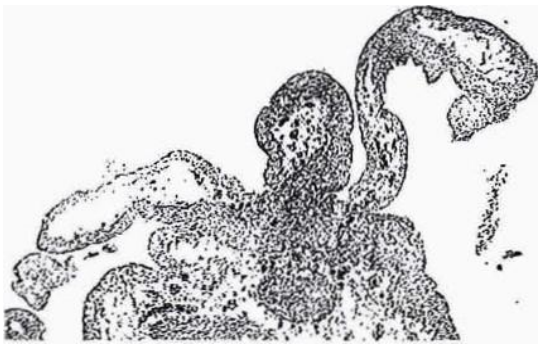




Flo. 2. *A,* forceps biopsy of bladder mucosa with ulceration, degenerative changes and microabscesses in urothelium and dilated vascular channels in lamina propria. H & E, reduced from X182. *B,* forceps biopsy of bladder mucosa shows prominent hemorrhage in lamina propria, probably resulting from extravasation of erythrocytes. H & E, reduced from X230.



F1o. 3. Forceps biorsy of bladder mucosa from posterior wall 5 weeks after removal o catheter. No noteworthy pathological changes are present. H & E, reduced from x230.

patients suffered urosepsis that was treated by antibiotics. The remaining 14 patients functioned well after removal of the catheter and were satisfied with the situation. When the catheter was removed the bladder capacity was >300 cc in 8 patients, and between 35 and 200 cc in 7. Only 2 patients had a bladder capacity of <300 cc after 5 weeks although these patients had increased the initial bladder capacity from 100 and 125 to 200 and 220 cc, t·espectively. These 2 patients had been confined to catheter treatment for >5 years.



Fto. 4. Forceps biopsy of combined polYPoid and papillary lesion shows marked resemblance to conventional llrothelial papilloma. H: & E, reduced from *X* 58.

## DISCUSSION

Catheter-associated polypoid and bullous lesions of the bladder mucosa are common and well recognized conditions to the uxologist. Reports of the histopathological appearance are rare,&,[8] and its natuxal history and clinical significance have not been well characterized. In an autopsy study Ekelund and Johansson demonstrated polypoid cystitis in 80 per cent of the patients treated with permanent indwelling catheters.[6] In our study all patients had polypoid cystitis, even those who had hsn a catheter for 1 month only. In our clinical practice we have observed bladder lesions with the characteristic cystoscopic and histologic appearance of polypoid cystitis already after 1 week of catheter treatment. The discrepancy in frequency between the autopsy study and oux study is mainly owing to a greater awareness of the lesion and to the cystoscopic examination performed in our study. It seems reasonable to assume that practically all patients with permanent indwelling urethral catheters eventually will suffer polypoid cystitis as a result of chronic mechanical irritation from the tip of the catheter and/or possible suction."[8,16] We found no clear correlation between the extent and sevet·ity of the polypoid cystitis, and the duxation of catheter treatment, although the most pronrinent lesions were found among those with catheter treatment >6 months.

In 13 of 15 patients available for followup polypoid cystitis disappeat·ed despite persistent ba teriuxia in most cases. However, polypoid cystitis remained after 10 weeks in 5 patients and even persisted after 6 months in 1. Thus, it seems as if polypoid cystitis is a reversible lesion, although it may persist for a considerable interval after removal of the cathete1·.

Polypoid cystitis may be confu:;ed cystoscopically and histologically with a bladder tumor (fig. 4). Hematuxia is as common in patients with a uxinary catheter as fn those with a bladder tumor. In such cases the location of the lesion may be of some help in the differential diagnosis, since polypoid cystitis is located predominantly in the posterior wall or dome of the bladder. Bladder tumors ru·e rare in these locations. In cases of persistent po.lypoid cystitis after catheter removal the differential diagnosis between bladder tumor and polypoid cystitis is even more difficult, and the necessity to make adequate biopsies fot· histopathological diagnosis in any doubtful case must be emphasized.

Of the 20 p(ltients with polypoid cystitis included initially in the study 19 had significant bacteriuxia. Bacterial cultuxes from biopsy material showed identical bacterial flora to that of the uxine sample, thus, contradicting the hypothesis that certain bacteria are involved in the development of polypoid cystitis. The lesions also disappeared despite persistent bacteriuria. Removal of the indwelling catheters has been reported earlier to decrease the frequency of bacteriwia as well as lower the proportion of nosocomial bacterial strains.[14] A similiar tendency also was found in oux study, although the figures were not statistically significant, possibly owing to the limited nwnber of patients studied.

REFERENCES

1. Thornton, G. F. and Andriole, V. T.: Bacteriuria during indwelling catheter drainage. ll. Effect of a closed sterile drainage system. J.A.M.A., 214:339, 1970
2. .Alling, B., Brandberg, A., Seeberg, S. and Svanborg, A.: Aerobic and anaerobic microbial flora in th.e urinary tract of geriatric patients during long-term care. J. Infect. Dis., 127:34, 1973.
3. Beeson, P. B.: The case against the catheter. Editorial. Amer. J. Med., 24:1, 1958.
4. Hedlund, P. 0.: Kateterisering av urinblasan. Sodertiilje, Sweden: Astra Liikemedel AB, 1976.
5. Milles, G.:Cathet-er-induced hemorrhagic pseudopolyps of the urinary bladder. J.A.M.A., 193:968, 1965.
6. Ekelund, P. and Johansson, S.: Polypoid cystitis: a catheter associated lesion of th.e human bladder. Acta Path. Microbiol. Scand., 87A: 179, 1979.
7. Koss, L. G.: Tumors of the urinary bladder. In: Atlas of Tumor Pathology. Washington, D. C.: Armed Forces Institute of Pathology, 2nd series, fasc. 11, p. 106, 1975.
8. Mostofi, F. K., Sobin, L. H. and Torloni, H.: Histological typing of urinary bladder tumours. Geneva: World Health Organization, 1973.
9. Cowan, S. T. and Steel, K. J.: Manual for the Identification of Medical Bacteria. London: Cambridge University Press, 1970.
10. Edwards, P. R. and Ewing, W. H.: Identification of Enterobacteriacae, 3rd ed. Minneapolis: Burgess Publishing Co., 1972.
11. 1&-sson, P. and Oiling, S.: O antigen distribution and sensitivity to the bactericidal effect of normal human setum of Proteus strains from clinical specimens. Med. Microbiol. Immun., 163: 77, 1977.
12. Lidin-Janson, G., Falsen, E., Jodal, U., Kaijser, B. and Liucolin, K.: Characteristics of antibiotic-resistant Escherichia coli in the rectum of healthy school-children. J. Med. Microbiol., 10:299, 1977.
13. Ericsson, H. M. and Sherris, J. C.: Antibiotic sensitivity testing. Report of an international collaborative study. Acta Path. Microbioi. Scand. [B.], suppl., 217:3, 1971.
14. Brandberg, A., Seeberg, S., Bergstrom, G. and Nordqvist, P.: Reducing the number of nosocomial gram-negative strains by using high absorbing pads as an alternative to indwelling catheters in long-term care-a preliminary study. J. Hosp. Infect., 1: 245, 1980.
15. Tougaard, L.: Blaereslimkindelaesioner efter kateter a demeure Hyppighed og.lakalisation et sektionsmateriale. Ugeslu. Laeg., 133: 348, 1971.

## EDITORIAL COMMENT

This is an interesting study, revealing that the typical bullous changes occurring in patients with an indwelling catheter are the rule rather than the exception. These changes persisted in some patients for as long as 28 weeks after the catheter was removed and persistence was not related to chronic bacteriuria. It is important for all urologists to remember that a number of conditions, other than bacteriuria, can cause polypoid or cystic changes in the bladder urothelium and the mere finding of this condition is not an indication to institute antibacterial therapy. "All that's bullous is not infection." *W. R.F.*