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THE EFFECTS ON CATHETERS FOR SELF-CATHETERIZATION FOLLOWING DAILY LOADING

Hypothesis / aims of study

The aim of this study is to examine the effects on catheters for self-catheterization (hereinafter referred to as catheters) following dip loading in antiseptic solutions and friction loading.

Study design, materials and methods

Two types of silicon catheters (A, B), polyvinyl chloride catheters (C), disposable hydrophilic coating catheters (D), latex catheters (E) were used for this study.

1) Friction loading

Elastic urethane rubbers were used with a cavity of 3.4mm in diameter (pressure on the inside is 122~140cm H_2O). 0.5g of glass beads, 1mm in diameter, considered as small calculi, were inserted in the elastic urethane rubbers and were spread with lubricating jelly. Catheters were inserted there with a strength of less than 5N. Insertion of the catheters to a depth of 15cm, followed by withdraw, which was considered as one cycle. 70 treatment cycles, considered as a week's load, were conducted.

2) Following the treatment 1), catheters were dipped in artificial urine for one day and then were dipped in antiseptic solutions (0.025% benzalconium chloride, 0.025% bezethonium chloride, 0.025% bezethonium chloride with archilalyl polyether alcoholic liquid, a glycerin solution with 0.025% benzethonium chloride, 1.0% and 0.05% povidone iodine, a glycerin solution with 0.05% povidone iodine, 0.1% gluconic chlorhexidine) for 6 days at 25 . Changes in appearance and surface conditions(x200 and x1000) were observed. Coefficient of static friction was also measured. This was considered as one cycle (one week), and the changes were observed after the completion of the 2nd cycle.

Results

1) Appearance:
   a) Pigmentation of dark brown was detected and progressed day by day in D in all antiseptic solutions.
   b) Catheters dipped in a solution including povidone iodine:
      Pigmentation was detected and progressed day by day in all catheters besides E.
2) Surface condition of catheters
   No change was detected in A in all antiseptic solutions.
   Roughness on the surface of catheters was detected in B in a glycerin solution with 0.05% povidone iodine, and 0.1% gluconic chlorhexidine. Changes on the surface were detected in C in povidone iodine, 0.1% gluconic chlorhexidine. D caused the hydrophilic coating on the surface to dissolve in all antiseptic solutions. Changes on the surface were detected in E in 0.025% bezethonium chloride with archilalyl polyether alcoholic liquid, a glycerin solution with 0.05% povidone iodine, and 0.1% gluconic chlorhexidine.
3) Coefficient of static friction
   D(0.24) showed the most favorable value at the commencement of the study. B(1.00) showed the highest value. No significant change of coefficient of static friction, from 0.82, was detected in A at the commencement of the study, despite the fact that A and B were the same silicon catheters. Tendency for worse values, 1.15-1.36, were detected in B. Tendency for worse values, 0,70-0.85 from 0.59 in povidone iodine, 0.1% gluconic chlorhexidine were detected in C. Tendency for worse values, 0.56-0.85 in all antiseptic solutions caused by the dissolve of hydrophilic coating were detected in D. Tendency for worse values, 1.09-1.74 in all antiseptic solutions were detected in E, which showed 0.48 at the commencement of the study.

Interpretation of results

Among the catheters, silicon catheter A proved to be the most stable in antiseptic solutions. It was also shown that stability for antiseptic solution is different according to its quality. D caused the hydrophilic coating on the surface to dissolve in all antiseptic solutions at an early stage and proved to be inappropriate for repeating use. Noticeable deterioration in quality was detected in C, although it was relatively stable for the first week. Quality deterioration day by day was observed in E, caused mainly by the deterioration of the surface by friction loading. Antiseptic solutions with benzalconium chloride or benzethonium chloride were the most suitable for preserving catheters.

Concluding message

In this study, silicon catheters in the fourth grade ammonium salt solutions as antiseptics were the most suitable conditions for clean intermittent self-catheterization. However, quality of silicon, concentration of antiseptic solution, and toxicity for mucosa, etc. are also need to be considered.

FUNDING: NONE
DISCLOSURES: NONE