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PRE-OPERATIVE URINARY MICROBIOME REVEALS POST-OPERATIVE URINARY TRACT INFECTION RISK

Hypothesis / aims of study

Despite preventive efforts, women undergoing urogynecologic surgery face a 20% risk of developing a post-operative urinary tract infection (UTI). Women with positive day of surgery (DOS) urine culture (>10^3 CFU/ml) are ~6X more likely to develop a post-op UTI than those with negative cultures. This study evaluated the pre-operative urinary microbiome to assess predictive microbial characteristics associated with post-operative UTI.

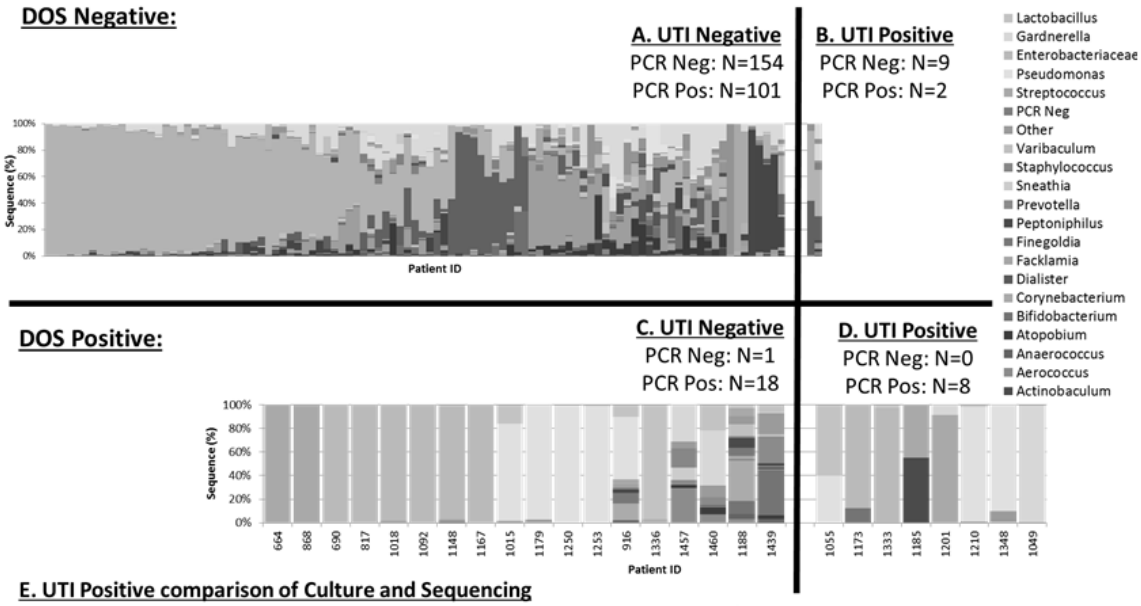
Study design, materials and methods

Catheterized urine samples were collected at the start of surgery prior to antibiotic administration. Samples were cultured using the standard method with a threshold of >10^3 CFU/ml. Samples also were subjected to 16S rRNA gene sequencing and classified to bacterial taxa using the mothur software package. The cohort was grouped first by DOS culture result (positive vs negative), then by occurrence of post-op UTI, and then by the dominant bacteria in the DOS sample.

Results

129 of 293 samples had sufficient biomass to sequence; 8% developed post-op UTI. We detected 4 patient groups (Figure 1). DOS-negative urines tended to be dominated by *Lactobacillus*, *Gardnerella*, *Corynebacterium* or were diverse (Panel A). Within this group, those that developed a post-op UTI (2%) tended to have bacterial DNA below threshold for sequencing (Panel B). Urines containing cultivatable bacteria (DOS-positive) were dominated by known uropathogens [e.g., *Pseudomonas* and Enterobacteriaceae (including *E. coli*, *Proteus*, and *Klebsiella*) (Panels C-D)]; these organisms grew to a biomass detectable by standard culture techniques. Of this sub-population, 31% developed a post-op UTI. DOS-positive patients contained DNA from the same family/genus as the bacterium thought to cause the post-op UTI; these urines typically contained the genus of the uropathogen species later detected by standard urine culture (Panel E). This group also tended to have mixed bacterial profiles (Panels D-E), typically containing one uropathogen and one non-pathogen (e.g., *Pseudomonas* and *Lactobacillus*). This result suggests that the causative agent was present prior to, and not introduced by, surgery.

Figure 1: DOS FUM Profiles: Catheterized urines from women undergoing POP/UI surgery were cultured and sequenced. Culture gave two groups, DOS culture-positive and -negative. DOS-positive individuals had increased risk of post-op UTI. The table (E) shows the comparison of all culture and sequencing results for subgroup D.



E. UTI Positive comparison of Culture and Sequencing

Patient ID	DOS Culture (CFU/ml)	Post-op UTI Culture (CFU/ml)	DOS Sequencing
1055	*P. aeruginosa* >100,000	*P. aeruginosa*	*Pseudomonas* with *Lactobacillus*
1173	*E. coli* >100,000	*E. coli* >100,000	Enterobacteriaceae with *Bifidobacterium*
1333	*E. coli* >100,000	*E. coli* 80,000	Enterobacteriaceae with *Lactobacillus*
1185	*Staphylococcus* sp. > 100,000 & *Actinomyces meyeri* >100,000	*P. mirabilis* >100,000	*Staphylococcus* with *Actinomyces*
1201	*Staphylococcus* sp. >100,000	*E. coli* >100,000	*Staphylococcus* with *Gardnerella*
1210	*P. aeruginosa* > 100,000 & *P. aeruginosa* 50,000	*Lactobacillus* 6,000 & *Lactobacillus* 100,000	*Pseudomonas* with *Lactobacillus*
1348	*P. aeruginosa* 20,000	*P. aeruginosa* 5,000	*Pseudomonas* with *Corynebacterium*
1049	*Clostridium* sp. >100,000	*K. oxytoca* >100,000 & *E. coli* >100,000	*Gardenerella* with *Lactobacillus*

Interpretation of results

The risk of post-op UTI may be reduced by timely information about the DOS urinary microbial community given that prior to surgery a member of the genus/family of the causative agent was often present in DOS-positive patients. Variables associated with surgical events (trauma, immune suppression, antibiotic treatment) may cause preventable dysbioses resulting in clinical UTI.

Concluding message

These data should be used to inform UTI prevention studies and to improve pre-surgery screening techniques, such as the Expanded Quantitative Urine Culture (EQUC) method, to appropriately identify and treat women at risk for post-op UTI.

References

1. Fok CS, McKinley K, Mueller ER, et al. Day of surgery urine cultures identify urogynecologic patients at increased risk for postoperative urinary tract infection. The Journal of urology. 2013;189(5):1721-1724.

Disclosures

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