

Bacterial Biofilm Formation on Vaginal Ring Pessaries Used for Pelvic Organ Prolapse

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Introduction

A biofilm is a community of adherent microorganisms within a matrix composed of extracellular polymeric substances. Microbial biofilms form on inanimate surfaces within the body, including vaginally placed devices. Biofilms are also implicated in infection persistence, as organisms within the biofilm matrix are protected from antimicrobials. Our current knowledge of the vaginal microbiota and biofilm formation on indwelling medical devices suggests that biofilms may develop on vaginal pessaries and contribute to bothersome vaginal symptoms. However, the relationship between vaginal symptoms and the microbial composition of vaginally placed devices is unknown. The primary objective of this study was to identify and characterize the bacterial biofilm on vaginal ring pessaries used to treat pelvic organ prolapse. Secondary objectives were to explore the association between pessary biofilm microbiota composition and pessary-related complications as well as the relationship between pessary and vaginal microbiota composition.

Aims

The objective of this study was to characterize the bacterial biofilm on vaginal ring pessaries used to treat pelvic organ prolapse and investigate the relationship between biofilm phenotype and patient symptoms and clinical signs that are suggestive of inflammation.

Methodology

This was a cross-sectional observational study of 40 women wearing a ring-shaped pessary continuously for at least 12 weeks. Participants underwent a clinical examination, and the pessary was removed. Clinical signs were recorded. A swab from the pessary surface and a high vaginal swab were collected from each woman. Participants completed a questionnaire on symptoms. Pessary biofilm presence and phenotype were determined by scanning electron microscopy (SEM). Vaginal and pessary bacterial composition was determined by 16S rRNA gene sequencing. The relationship between biofilm phenotype and symptoms and clinical signs was assessed using logistic regression.

Results

SEM confirmed biofilm formation on all 40 pessaries. Microbiota data were available for 25 pessary swabs.

Results

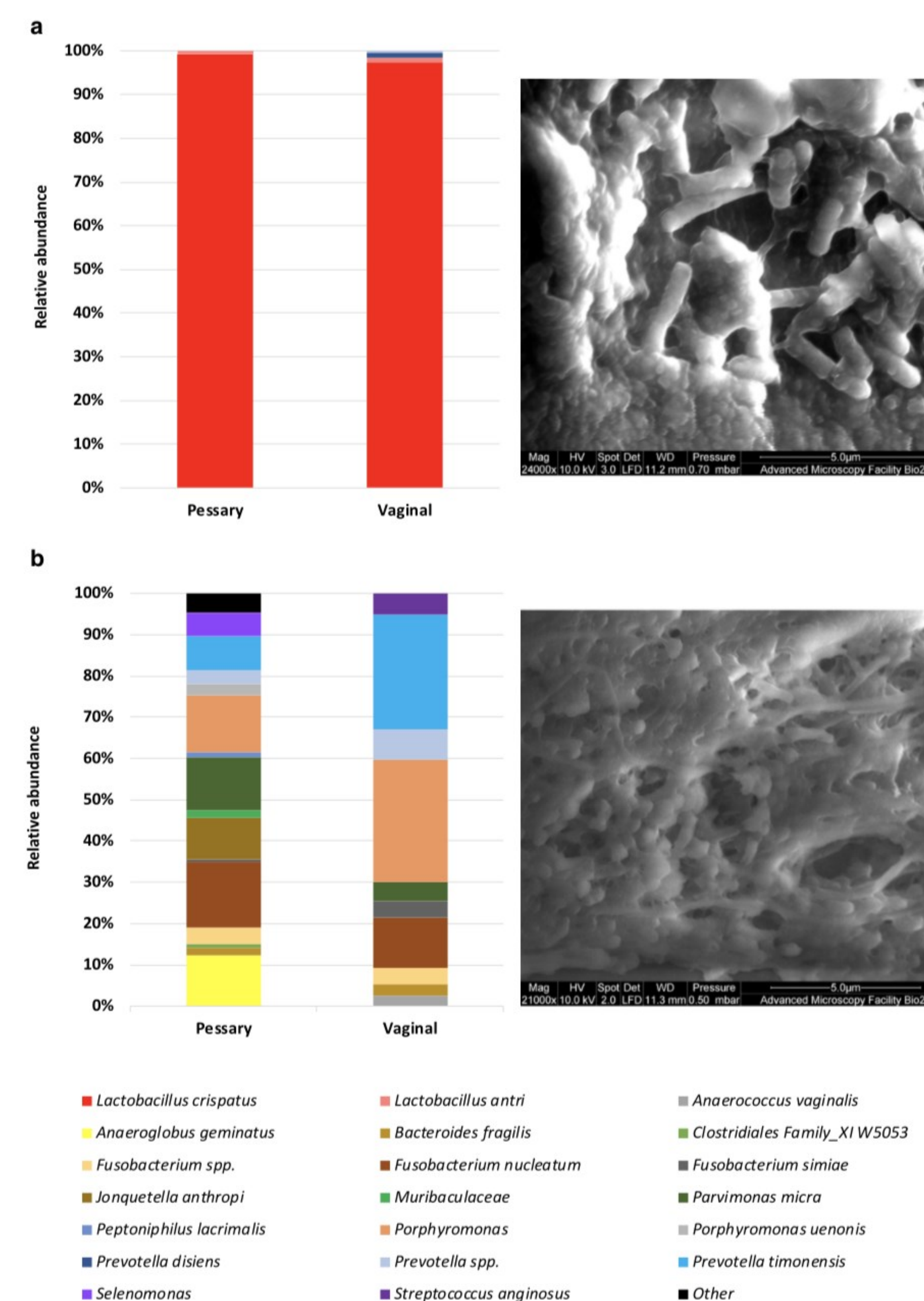


Fig. 1 Paired vaginal and pessary samples from a woman demonstrating (a) Lactobacillus-dominated microbiota and (b) Lactobacillus-deficient microbiota by 16S rRNA gene sequencing and SEM

The pessary biofilm microbiota was composed of bacteria typically found in the vagina and was categorized into Lactobacillus-dominated ($n = 10/25$ pessaries, 40%) communities and Lactobacillus-deficient communities with high relative abundance of anaerobic/ facultative anaerobes ($n = 15/25$ pessaries, 60%). While increasing age was associated with presence of a Lactobacillus-deficient pessary biofilm (odds ratio = 3.60, 95% CI [1.16–11.22], $p = 0.04$), no associations between biofilm microbiota composition and symptoms or clinical signs were observed.

Conclusions

Lactobacillus-deficient biofilms commonly form on pessaries following long-term use. However, the contribution of biofilm phenotype to symptoms and clinical signs remains to be determined.