Cervical cerclage using braided suture: vaginal dysbiosis inflammation and increased intrauterine death and preterm birth

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Objective
Cervical cerclage is frequently performed to support the cervix and mucosal plug as a barrier to ascending infection and prevent preterm birth (PTB), yet the procedure itself is associated with infection. Currently, braided rather than monofilament sutures are predominately used for the cerclage without an evidence base. We hypothesized that braided suture material promotes pathobiont colonization of the vagina leading to activation of inflammation and adverse cervical vascular remodeling associated with poor pregnancy outcome. We aimed to address this in a prospective longitudinal study in pregnancy.

Methods
Analysis of 10 years of cerclage procedures across 5 UK hospitals, was followed by randomization of pregnant women at risk of PTB with a short cervix (<25mm) to either braided (n=25) or monofilament cerclage (n=24). Transvaginal scans and high vaginal swabs were taken prior to cerclage and at 4, 8, 12 and 16 weeks post-insertion. Characterization of the vaginal microbiome was performed using MiSeq sequencing of 16S rRNA gene amplicons (V1-V3) and multiplex cytokine arrays assessed corresponding expression of inflammatory mediators. Vaginal microbiome dysbiosis was classified as normal, intermediate or dysbiotic using Ward linkage hierarchical clustering. 3D/4D ultrasound quantified matched changes in cervical vascularity.

Results
Analysis of 678 cerclage procedures revealed braided cerclage increased rates of intrauterine death (16% v 5%, P<0.0001) and PTB (28% v 17%, P<0.001) compared to monofilament cerclage. In the prospective study, braided cerclage caused a persistent 5-fold shift towards vaginal microbiome dysbiosis compared to pre-cerclage microbial profiles (P<0.01). This shift in vaginal bacterial communities was associated with significantly increased expression of pro-inflammatory mediators IL-β, IL-6, IL-8, TNF-α and MMP-1, and prematurely induced cervical vascularization (P<0.05). In contrast, monofilament cerclage insertion reduced vaginal dysbiosis (0.8 fold change, P<0.01), maintained Lactobacillus spp. stability without increasing in inflammation or cervical vascular remodeling.

Conclusion
This is the first study to investigate the impact of the cerclage on the vaginal microbiome. Current practice using braided cerclage significantly disrupts the stability and dominance of Lactobacillus spp. driving inflammation and premature cervical change. A review of current clinical practice may be justified.