

EP09.30 Ex-vivo insertion, adhesion and tissue toxicity of a sterilized sealing system patches for post-fetoscopy membrane defects

Hazmi IH¹, Micheletti T¹, Febas G², Yong SL¹, Borrós S², Gratacós E^{1,3,4,5}, Eixarch E^{1,3,4}

¹ BCNatal | Fetal Medicine Research Center (Hospital Clínic and Hospital Sant Joan de Déu), University of Barcelona, Barcelona, Spain; ² Grup d'Enginyeria de Materials (GEMAT), Institut Químic de Sarrià, Universitat Ramon Llull, Barcelona, Spain; ³ Institut d'Investigacions Biomèdiques August Pi I Sunyer (IDIBAPS), Barcelona, Spain; ⁴ Institut d'Investigacions Biomèdiques August Pi I Sunyer (IDIBAPS) and Centre for Biomedical Research on Rare Diseases (CIBERER), Barcelona, Spain; ⁵ Institut de Recerca Sant Joan de Déu (IRSJD), Fundació Sant Joan de Déu, Barcelona, Spain.

INTRODUCTION

CLINICAL PROBLEM

Iatrogenic preterm prelabor rupture of membranes following fetoscopic surgery.

CURRENT LIMITATION

Attempts to seal fetoscopy-induced membrane defects have been unsuccessful.

OBJECTIVE

To evaluate the feasibility of insertion, 15-day adhesion and tissue toxicity of sterilized sealing system patches (SSp) designed to seal post-fetoscopy membrane defects in ex-vivo simulation models.

SSp COMPONENTS

- ❖ Mesh-reinforced silicone (MrS)
- ❖ Bioadhesive (BA)

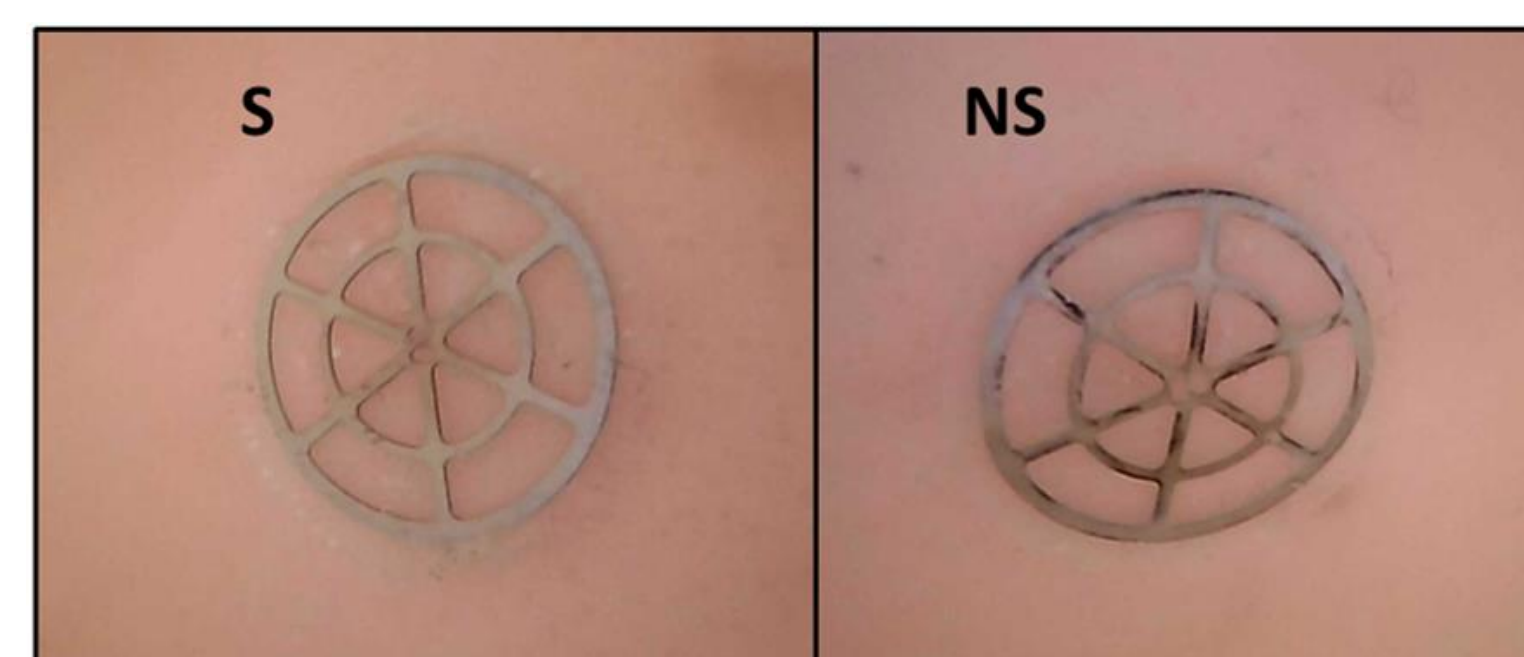
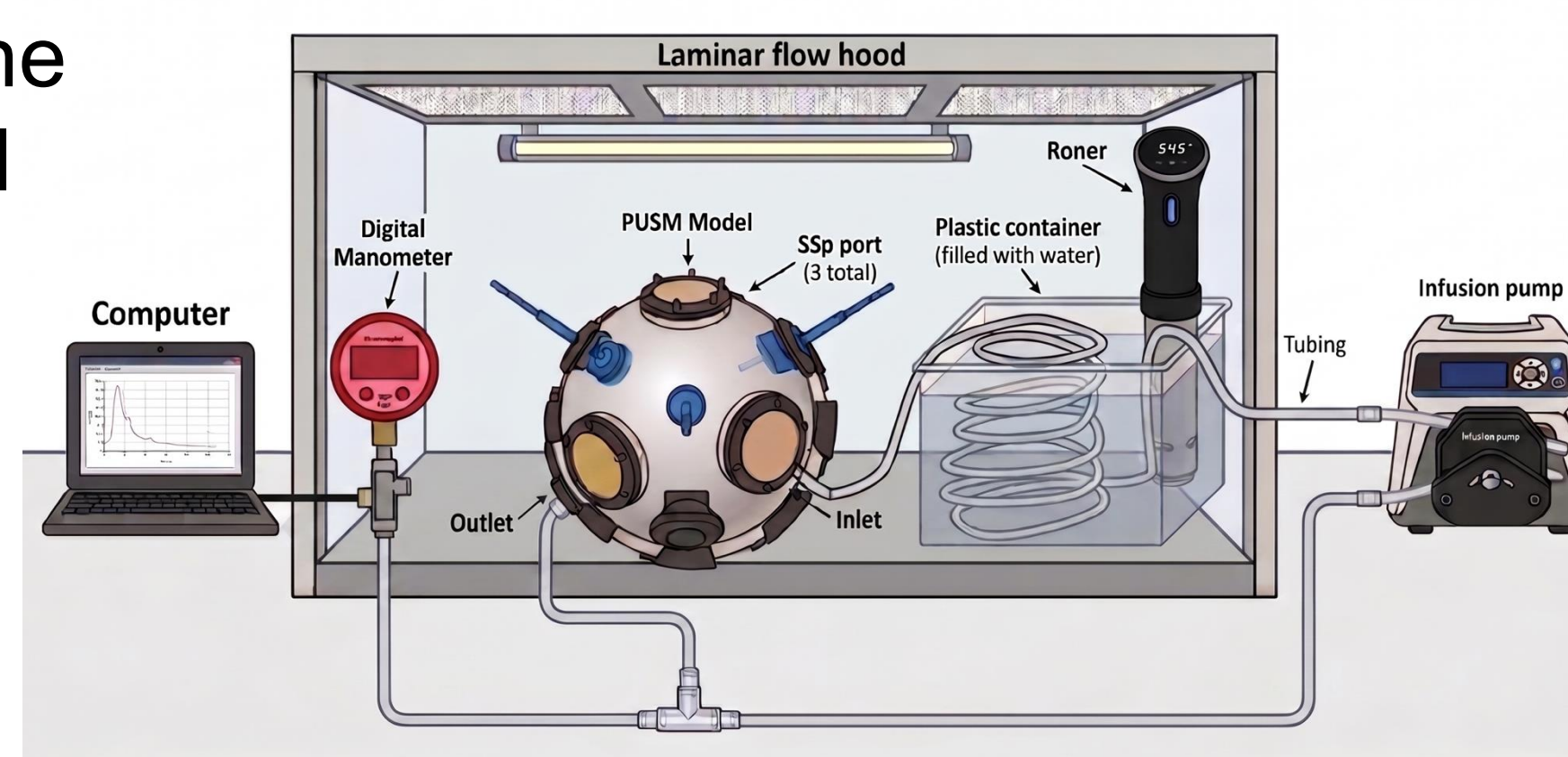
EVALUATED PARAMETERS

- ❖ Insertion feasibility
- ❖ Complete adhesion over 15 days
- ❖ Tissue toxicity

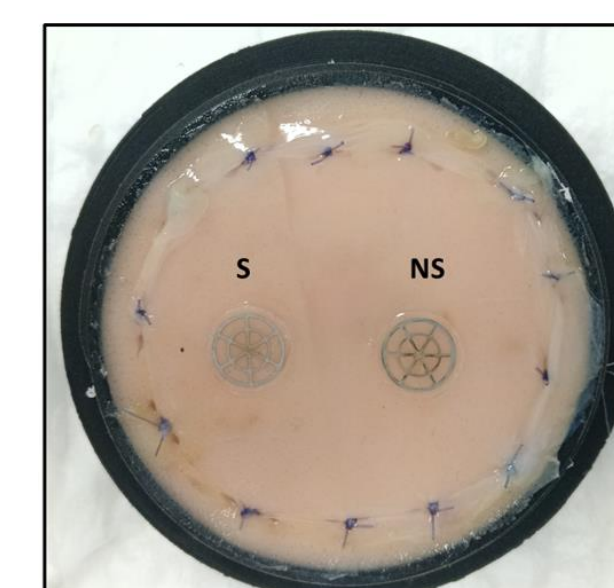
METHODOLOGY

ADHESION TEST

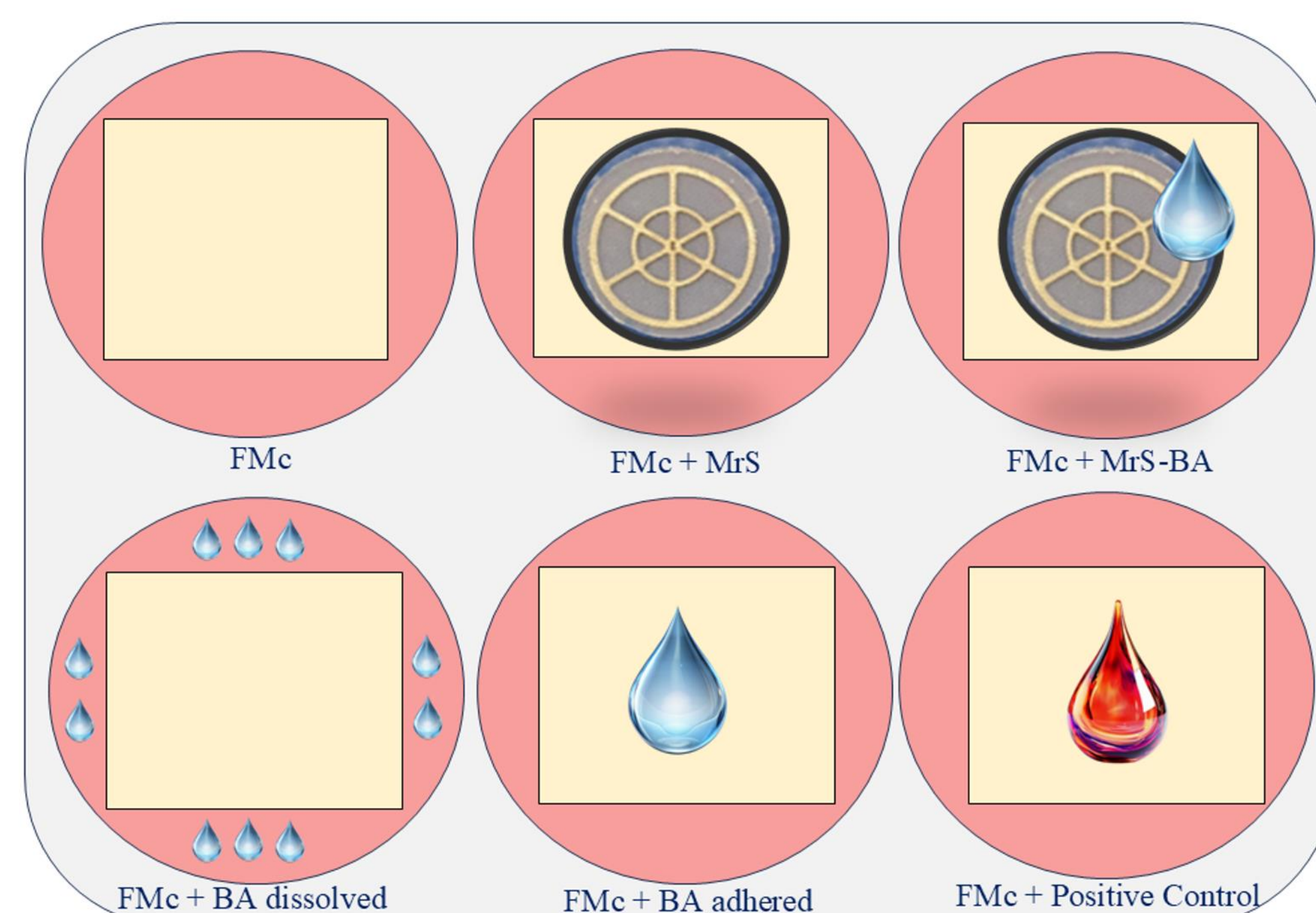
- Mounting human fetal membrane (hFM) on the phantom of pregnant uterus simulating model (PUSM).
- Continuous flow during insertion of SSp.
- Incubating at 37°C, 5% CO₂ post insertion.
- Changing solution every 48h.
- n=6 Sterilised SSp (MrS: ETO; BA:dry-heat)
- n=6 non-sterilized SSp.



- Daily endoscopic monitoring of adhesion over 15 days followed
- Manual inspection post experiment.
- Successful insertion & adhesion rate compared.



TOXICITY TEST



- Culturing hFM for 48h with sterilized MrS-BA patches, positive, and negative controls.
- Amnion pyknotic index compared.

- **Red coloured wells:** Amniomax solution
- **Yellow square:** human fetal membrane
- **Blue drop:** sterilised BA
- **Red drop:** commercial adhesive
- **FMc:** fetal membrane culture

RESULTS

- **Successful insertion** (12/12).
- **Mean insertion time** sterilized vs non-sterilized SSp (25.5 vs 27.8s, p=0.29).
- **Complete adhesion:**
 - Sterilised SSp (5/6)
 - Non-Sterilised SSp (6/6)

$p = 1.0$
- **Pyknotic index:**
 - Sterilized MrS-BA patches vs negative vs positive controls (42% vs 14% vs 77%, p<0.0001) (Figure 1 & 2).

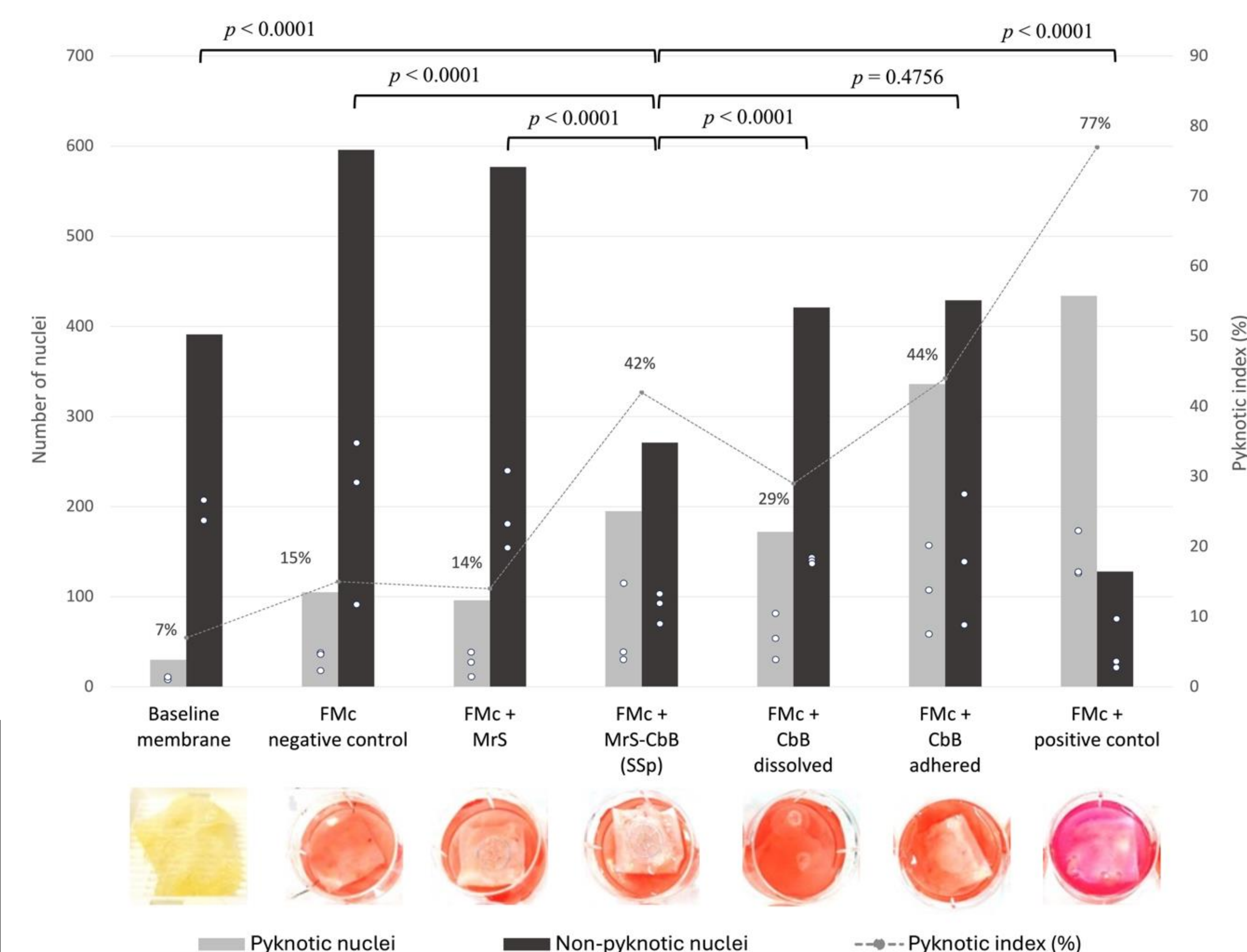


Figure 1: Combined bar and line graph showing the number of pyknotic and non-pyknotic nuclei and pyknotic index.

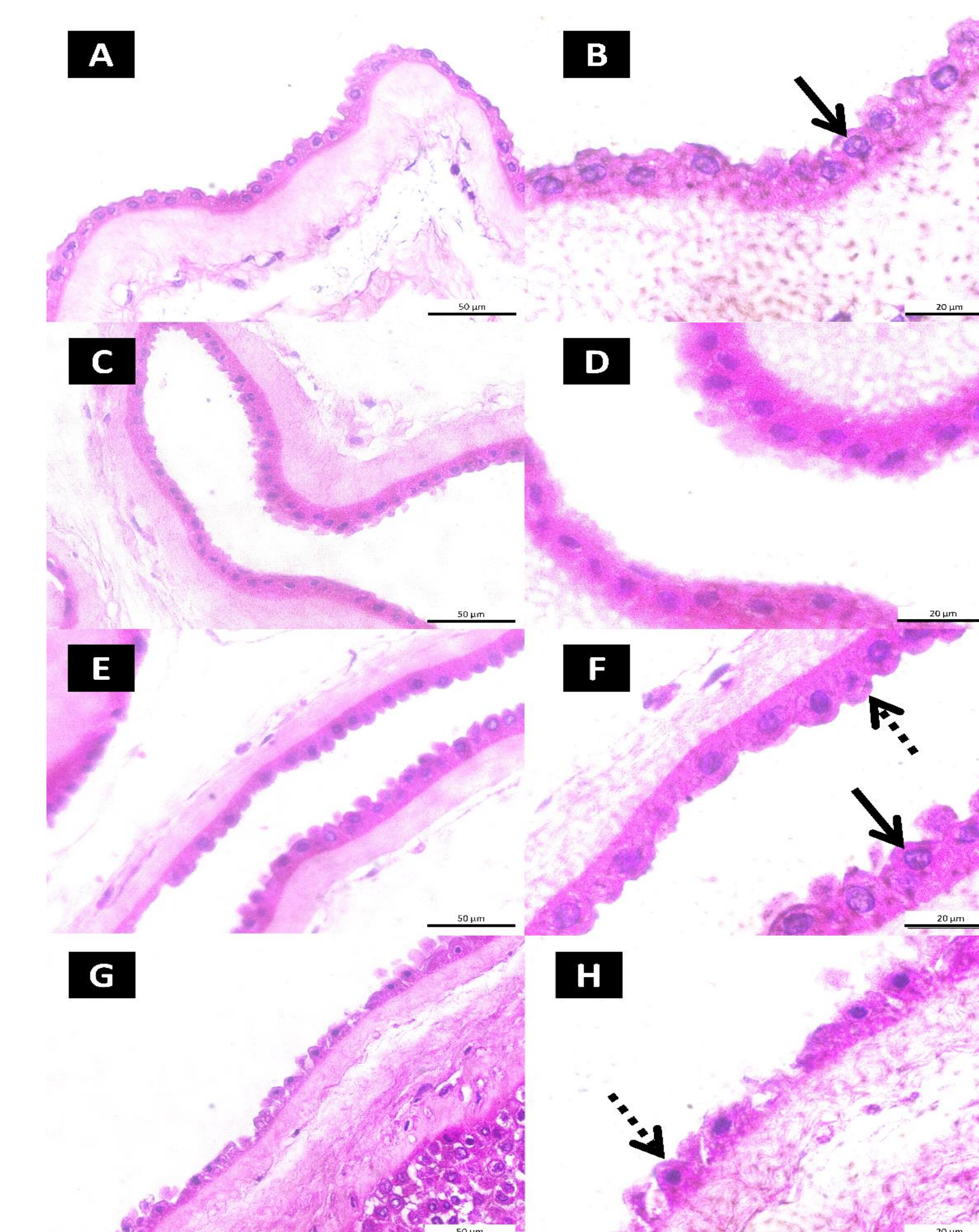


Figure 2: Histological assessment of toxic effects on fetal membrane amniotic layer (haematoxylin eosin) at 40x objective and 100x oil-immersion objective respectively, (A,B) Baseline FM, note the normal cell (black arrow), (C,D) FMc negative control, (E,F) FMc MrS-BA, and (G,H) FMc with positive control, note the pyknotic cell (dotted arrow).

CONCLUSION

- ❑ **MrS-BA SSp:**
 - ✓ Feasible insertion.
 - ✓ 15-day sustained adhesion.
 - ✓ Low tissue toxicity.
 - ✓ Potential usage in fetoscopic surgery.