Are Baseline Bladder Volumes Achieved at Different Pressures using Xenogenic Urinary Bladder Matrix (UBM) Grafts in Ovine Models?

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Introduction
The urinary bladder’s high viscoelasticity and contractile properties mean that it is a difficult organ to augment or replace. It is highly compliant and can accommodate large intravesical volume changes while maintaining almost constant pressure values. Functional neo-bladders have been created with xenogenic biomaterials, however decreased post-operative bladder capacity secondary to the xenograft’s poor distensibility is a persistent clinical limitation. This study aims to address volume limitations by applying larger xenografts to smaller bladder defects.

Materials and Methods
Mean bladder volumes at 5, 10, 15 and 20mmHg were measured after the genitourinary tract of female lambs was dissected (Fig 1) (n=5, age 7/12). Partial cystectomy was then performed (average size 9cm\textsuperscript{2}) and the cystectomy defect was repaired twice. The defect was initially repaired with a 9cm\textsuperscript{2} segment of xenogenic urinary bladder matrix (UBM) and subsequently with a 36cm\textsuperscript{2} segment of UBM. Bladder volume measurements were repeated at 5, 10, 15 and 20mmHg and compared to baseline values.

Results
Bladder capacity decreased by a mean of 39.6\% (Fig 2)(105.8mls) (n=5, range: 37.5- 41.3\%) throughout all pressure changes after the 9cm\textsuperscript{2} UBM replaced an equal sized bladder wall defect. In comparison, bladder volumes improved when the 9cm\textsuperscript{2} bladder wall defect was replaced with a 36cm\textsuperscript{2} segment of UBM but remained consistently lower than baseline values by a mean of 18.6\% (51.75mls) (n=5, range: 16.1-19.9\%) throughout all pressure changes.

Discussion and Conclusions
This study demonstrates that implanting a xenograft with a surface-area greater than the defect site can improve bladder volume. However baseline volumes were not achieved despite a 4 fold increase in the graft’s surface area after partial cystectomy.

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