Fig 1.6.7.1. The constituents of the ideal tissue engineered prosthesis (blue) and its outputs (red).
Fig 2.11.1. Variable stress rig (1) utilising inverted Scaffdex™ rings in a six well culture plate with four ball bearings used to vary stress on alternate days.
Fig 2.11.2. Variable stress rig (2) utilising cut Scaffdex™ rings with four ball bearings used to vary stress on alternate days.
Intraoperative complications:
- Visceral injury
- Vascular injury
- Neural injury
- Blood loss
- Haematoma

Post-op complications:
- Abscess
- Fistula
- Nerve entrapment
- De novo urgency
- Pain/ dyspareunia

Causes of bladder outflow obstruction:
1) Haematoma
2) Host inflammatory response
3) Mesh infection
4) Mesh Folding

Causes of erosion:
1) Infection
2) Host inflammatory response
3) Progression of tissue laxity
4) Non integration of mesh
5) Biomechanical mismatch

Causes of failure:
1) Progression of tissue laxity
2) Non integration of mesh
3) Failure of mesh to stimulate new ECM production

Procedure 0 6wk 12mo 5 yrs >10 yrs

Fig 10.1.1. Timeline of the failure and complications for synthetic mesh procedures for SUI.
Intraoperative complications:
- Visceral injury
- Vascular injury
- Neural injury
- Blood loss
- Haematoma

Post-op complications:
- Abscess
- Fistula
- Nerve entrapment
- De novo urgency
- Donor site morbidity

Post-op complications:
- Abscess
- Fistula
- Nerve entrapment
- De novo urgency
- Donor site morbidity

Causes of erosion:
1) Infection
2) Non integration of sling

Causes of bladder outflow obstruction:
1) Surgical technique
2) Haematoma
3) Host inflammatory response

Causes of failure:
1) Progression of tissue laxity
2) Sling degradation
3) Failure of mesh to stimulate new ECM production

Fig 10.1.2. Timeline of the failure and complications for autologous pubovaginal slings.
Intraoperative complications:
- Visceral injury
- Vascular injury
- Neural injury
- Blood loss
- Haematoma

Post-op complications:
- Abscess
- Fistula
- Nerve entrapment
- De novo detrusor overactivity
- Pain/dyspareunia

Causes of erosion:
1) Infection
2) Non integration of sling

Causes of bladder outflow obstruction:
1) Surgical technique
2) Haematoma
3) Host inflammatory response

Causes of failure:
1) Progression of tissue laxity
2) Sling degradation
3) Failure of mesh to stimulate new ECM production

Fig 10.1.3. Timeline of the failure and complications for biological grafts for SUI.
Fig 10.1.4. Schematic of the host inflammatory response to synthetic implants. The degree of beneficial tissue integration (green box) depends on a number of factors (orange box). Most meshes will lie at a point on the purple arrow.

Synthetic mesh implanted → Formation of biofilm → Scaffold
- Composition
- Weight
- Pore size
- Pattern
- Biomechanics

Chronic inflammation (TH 1)
- Leucocytes
- Macrophages
- Granulocytes
- Encapsulation

Leucocytes
- Macrophages
- Complement
- Clotting cascade
- Fibrinolytic cascade

Tissue integration
- Macrophages
- Fibroblasts
- Neovascularisation
- New ECM

0% → 100%
Fig 10.1.5. Schematic of the host inflammatory response to autologous transplants. It is not known what triggers an autologous graft to be degraded and fail (red box) or integrate (green box). Weakening of native tissue leads to long term failure.
Fig 10.1.6. Schematic of the host inflammatory response to biological grafts. If there is a poor inflammatory response to the graft then encapsulation occurs. The factors that are postulated to lead to a beneficial M2 response or to the undesirable M1 response are shown in the orange box. Both the M1 and M2 may occur with grafts at various time points.
Fig 10.2.1. Schematic of the target host inflammatory response to tissue engineered scaffolds. The key processes are the correct macrophage response to the scaffold with cells and persistence of the transplanted cells to continue ECM production.
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Table 10.3.1. Summary of the relative properties of scaffolds with and without restraint and with variable stress or Vitamin C. +++ is given to best scaffold, ++ to next scaffold which is significantly less than that the first scaffold (p<0.05) then + for next change in significance and finally +/--. Contraction could not be graded and is shown as %. 

187
Oral mucosa biopsy

Tissue minced

Enzymic digestion

Expansion in culture (2 weeks)

Add to methyl cellulose and add to scaffold

Expand to scaffold & culture (0-4 weeks)

Implant in patient

Clean room laboratory

In theatre during surgery

Fig 10.3.1. Schematic of the current method of manufacture of a tissue engineered prosthesis (red) and a proposed one-stage procedure to be completed completely in theatre.
Fig 10.4.1. Schematic of future work with the tissue engineered prostheses to progress to a pilot study. Yellow boxes show in vivo assessments. Red arrows show work that is critical before a clinical pilot study. Blue arrows and boxes are methods which may be used to improve the prostheses and are not essential.