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INFLAMMATORY RESPONSE AFTER FASCIAL RECONSTRUCTION OF ABDOMINAL WALL DEFECTS WITH PORCINE DERMAL COLLAGEN AND POLYPROPYLENE IN RATS

Aims of Study
To assess the inflammatory response after implantation of a novel porcine dermal collagen-derived material (Pelvicol) in comparison to polypropylene mesh (Prolene). Pelvicol is suggested as an alternative to synthetic implants in fascial reconstruction, as it may reduce complications without decreasing efficacy.

Methods
Full thickness abdominal wall defects were created in rats and reconstructed with Pelvicol or Prolene. Animals were sacrificed on day 7, 14, 30, and 90 to evaluate the presence of herniation, infection, adhesions, and changes in thickness and tensile strength of the implants. Histopathology (H&E) and immunohistochemistry were performed to measure the inflammatory response; Movat staining was used to detect collagen deposition.

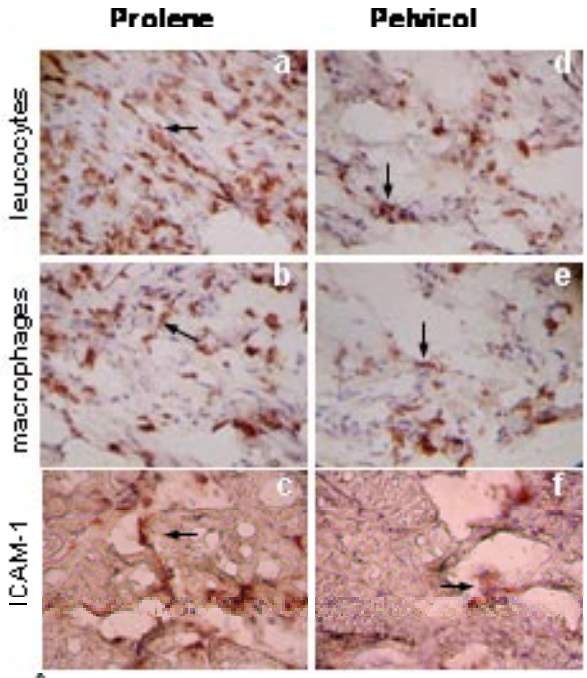
Results
Pelvicol induced a remarkable inflammatory response manifested by infiltration in the interface between implants and tissue with granulocytes, macrophages and NK cells which showed up-regulated expression of surface activation markers ICAM-1 and CD11 (Figure). This response was, however, significantly less severe and declined faster than with Prolene which also caused more adhesions. Moreover, Pelvicol showed a slower, but more orderly collagen deposition paralleling the surface of the implant. This was related to a slower increase in thickness ($p<0.05$) and tensile strength ($p<0.05$) with Pelvicol as compared to Prolene early on, but this difference disappeared by day 90 (Table).

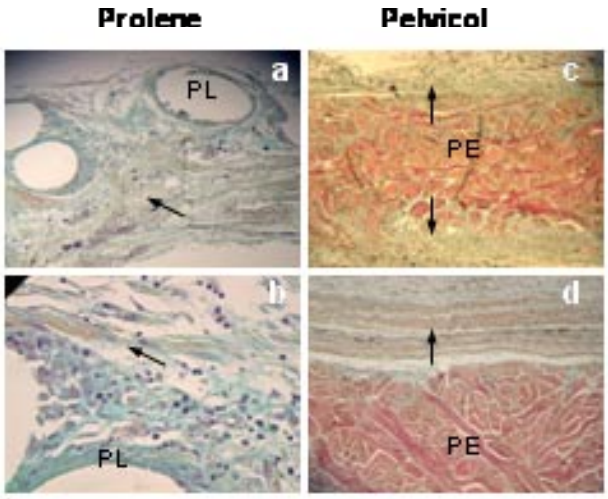
Conclusions
Pelvicol showed better biological compatibility than Prolene, i.e. less adhesions, more orderly collagen deposition and a comparable tensile strength after 90 days.

Table. Histological scores of microscopic examination of Pelvicol vs. Prolene after implantation

Days	Group	Foreign body giant cells[1]	PMN[1]	MN[1]	Vascularity[1]	Collagen[2]		
						Organization	Composition	Amount
7	PL	1.1 ± 0.4	3.0 ± 0.1	2.8 ± 0.2	2.7 ± 0.2	0.2 ± 0.2	0.6 ± 0.2	0.7 ± 0.1
	PE	0.6 ± 0.2*	2.0 ± 0.4*	2.1 ± 0.3*	1.5 ± 0.2*	0.9 ± 0.4*	0.6 ± 0.2	0.5 ± 0.2
14	PL	2.3 ± 0.3	2.9 ± 0.1	2.9 ± 0.1	2.3 ± 0.3	0.6 ± 0.2	0.9 ± 0.1	1.1 ± 0.2
	PE	1.5 ± 0.3*	1.5 ± 0.3*	1.8 ± 0.3*	1.8 ± 0.3	1.3 ± 0.3*	0.8 ± 0.1	0.7 ± 0.1*
30	PL	2.8 ± 0.3	2.6 ± 0.2	2.6 ± 0.2	2.4 ± 0.2	1.3 ± 0.3	1.8 ± 0.1	1.8 ± 0.1
	PE	1.1 ± 0.1*	0.7 ± 0.2*	0.9 ± 0.2*	1.5 ± 0.2*	1.8 ± 0.1*	1.4 ± 0.1*	1.3 ± 0.2*
90	PL	2.4 ± 0.2	1.3 ± 0.2	1.9 ± 0.2	2.7 ± 0.1	1.6 ± 0.2	1.9 ± 0.2	2.6 ± 0.2
	PE	0.7 ± 0.2*	0.3 ± 0.2*	0.3 ± 0.2*	1.3 ± 0.2*	2.5 ± 0.2*	2.3 ± 0.2	2.3 ± 0.2

PMN: polymophonuclear cell; MN: Mononuclear cells; PL: Prolene; PE: Pelvicol. [1] = number per high power field. [2] = ordinal score 0-4. Values are mean±SEM (n=8). * $p < 0.05$. (Pelvicol vs Prolene)





Collagen deposition (arrows) in Prolene (a,b) and Pelvicol (c,d) at 90 d after implantation. Movat stains elastic fibres purple to black, collagen stains yellow. Top row: 100x, bottom 400x. Collagen deposition is more orderly in the Pelvicol implant animals.

IHC stain for leucocytes (OX-1), macrophages (ED-1) and ICAM-1 (BD Pharmingen) in Prolene (a-c) and Pelvicol (d-f) animals. (arrow: positive staining cells). The cellular response is milder in Pelvicol animals.