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REVIEW

Polyester vs polypropylene, do mesh materials matter? A meta-analysis and systematic review

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Purpose: Controversy exists regarding the outcomes following ventral hernia repair with polypropylene (PP) or polyester (PET) mesh. Monofilament PP less frequently requires extraction in the setting of contamination compared to multifilament PET mesh. The purpose of this systematic review and meta-analysis was to analyze the clinical outcomes of ventral hernia repair with PP and PET mesh.

Patients and methods: A comprehensive literature search was performed using the Ovid search platform. Criteria included ventral hernia repair publications using either PP or PET mesh with a minimum follow-up duration of one year. Included studies were subject to data extraction including mesh position, weight, recurrence rates, infection, and complications. Random effect meta-analysis was run to provide pooled event rate and 95% CI.

Results: Ninety-seven studies including a total of 10,022 patients were included in the final analysis. Hernia recurrence rates are similar (4.8%, 95% CI [3.5–6.5] vs 4.7%, 95% CI [3.7–6.0]) as well as mesh infection rates (3.5%, 95% CI [2.5–4.9] vs 5.0%, 95% CI [3.9–6.3]) between PET and PP, respectively. Mesh infections occurred less frequently in laparoscopic repair compared to open (1.6%, 95% CI [0.9–2.6] vs 5.2%, 95% CI [4.3–6.3]).

Conclusion: This study suggests that mesh material does not affect recurrence or infection in ventral hernia repair and that surgery can be safely performed with both PP and PET mesh. A laparoscopic approach is associated with a decreased infection rate compared to open repair independent of mesh type.

Keywords: polyester, polypropylene, ventral hernia, recurrence, infection

Introduction

The safest and most effective implant for ventral hernia repair has been debated repeatedly since the advent of prosthetic mesh in the 1940s. The existing literature report varying results for infection rates and hernia recurrence with meshes placed in a myriad of positions. In particular, there has been longstanding controversy regarding the use of polypropylene (PP) versus polyester (PET) mesh. A landmark study in 1998 compared comparing hernia outcomes between PP, PET, and ePTFE meshes demonstrated a significantly greater incidence of enterocutaneous fistula formation, mesh infections, and recurrences with multifilament PET mesh compared to other materials.[1] This paper launched a debate regarding the efficacy of PET mesh that has spanned decades, resulting in a shift toward PP and ePTFE meshes.

Subsequent studies reported good outcomes with low morbidity following PET mesh hernia repair.[1,2] Placing PET mesh in an extraperitoneal location was identified as essential in the prevention of enterocutaneous fistulas.[3] In the prior study, PET had been placed within the peritoneal cavity, with nothing to protect the viscera from

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contact with the mesh. In the largest retrospective review of PET mesh hernia repairs with retrorectus or preperitoneal positioning, the overall recurrence rate was 1.5% and complication rate of 6.3%.[3,4]

In the decades to follow, numerous mesh products have been developed, including coated and composite meshes that allow for intraperitoneal mesh placement while minimizing risk of erosion of mesh into viscera. Colon et al reported no difference in postoperative complications and recurrence rates at 12 months following laparoscopic ventral hernia repair between PET composite and ePTFE mesh materials.[5] Advancements in engineering have also allowed for variations in mesh weight and pore size.[6] Heavyweight (HW) meshes generally have smaller pore sizes, but greater tensile strength due to the material itself, which activates a profound tissue reaction and dense scarring.[7] Smaller pore sizes may also limit bacterial clearance in the setting of infection. Alternatively, lighter weight products are reported to have greater tissue integration, more elasticity with retained tensile strength, and larger pore size meshes have greater likelihood to integrate in the setting of postoperative infections.[7] The durability of lightweight (LW) mesh implanted in ventral hernia repairs has been debated repeatedly. However, multiple studies have found no difference in recurrence rate based on mesh weight with follow-up greater than 2 years.[6,8–10] While most of the studies evaluating outcomes between LW and HW mesh evaluated PP materials, a 2015 study reported poor outcomes with LW PET mesh. In this study of 36 patients with LW PET mesh placed in the retro-rectus position, 8 (22%) recurrent hernias were identified. On reoperation, the authors reported that 7 of the 8 recurrences were due to a mechanical failure or fracturing of the mesh itself.[11] This study further fueled the debate regarding the efficacy of both LW mesh materials and PET.

The majority of studies comparing mesh materials are limited in patient numbers and often have inadequate follow-up to accurately determine long-term outcomes. In an effort to determine if mesh weight or material impacted hernia outcomes, we performed a systematic literature review and descriptive meta-analysis of ventral and incisional hernia repair studies specifically focused on estimating the risk of recurrence and infection in ventral hernia repair using PP and PET mesh.

Materials and methods

Search criteria

A comprehensive literature search was performed using the Ovid search platform. This platform encompassed 12 databases: Journals@Ovid Full Text, EBM Reviews – Cochrane Database of Systematic Reviews, EBM Reviews – ACP Journal Club, EBM Reviews – Database of Abstracts of Reviews of Effects, EBM Reviews – Cochrane Central Register of Controlled Trials, EBM Reviews – Cochrane Methodology Register, EBM Reviews – Health – Cochrane Central Register of Controlled Trials, EBM Reviews – Cochrane Methodology Register, EBM Reviews – Health Technology Assessment, EBM Reviews – NHS Economic Evaluation Database, BIOSIS Previews, Embase, Inspec, and MEDLINE.

Databases were searched using the keywords "ventral AND hernia AND mesh AND recurrence AND (placement OR overlap OR position)" and "Ventral hernia mesh repair." The literature was searched for articles discussing polyethylene terephthalate (PET) or polypropylene (PP) mesh used in ventral, incisional, or parastomal hernia procedures. Both generic PET/PP mesh terms and specific product terms were included in the search. No date filter was applied to this search.

Inclusion and exclusion criteria

Studies that met the above search criteria were considered for analysis. From these studies, those written in English or French, with a sample size of ≥25 patients, a mean follow-up ≥1 year, and an Oxford Classification of level 1, 2, or 3 were included in the final analysis. Studies that provided no clinical data or did not describe recurrence rate were excluded either for recurrence risk estimations. Additionally, studies that included Parietex™ and Parietene™ ProGrip™ self-gripping polyester (as the PLA grip provides fixation that can influence the recurrence results), studies that included Adhesix™ (that includes adherent properties) and studies with multiple meshes where it was not possible to clearly assign the results to the mesh were also excluded.

Data extraction

For comparative studies, each arm was assessed individually and inclusion/exclusion criteria were implemented for each arm. When prospective or retrospective papers reported different kinds of meshes, the subgroups were included only if the results were detailed enough to be able to assign the complications to different meshes with certainty and if each subgroup met inclusion criteria. When mesh weight was not described in the paper, but either the brand or the mesh was identified with certainty,

mesh weight was obtained from the company website, brochures, or publications.

The extracted data included the following: First author, year of publication, mesh studied, mesh weight, material, manufacturer, surgical approach, number of patients, hernia type, Oxford classification, methodology, mesh positioning, fascial closure, number of hernias treated, mean follow-up, previous ventral repair, number of recurrences, number of mesh-related recurrences, number of non-mesh-related recurrences, number of unknown recurrences, patient comorbidities, and patient preoperative medical history. Mesh weight was considered to be the weight of the mesh following absorption of the composite component. A LW mesh is defined as a mesh weighing 35–50 g/cm^2.[12] A HW mesh is defined as any mesh above 50 g/cm^2. Parameters with limited data were not analyzed.

Outcomes of interest

The primary outcome was to describe recurrence rates in ventral PET and PP hernia repair. The secondary outcome was to describe infection rates in ventral PET and PP hernia repair.

Statistical analysis

Primary and secondary outcomes were measured using incidence rate reported in individual groups from each single-arm study. Pooled estimation of risk was calculated using random effect model, as data come from literature review from heterogeneous and mainly non-randomized studies, using different methods and designs on various populations. An overlap between event rate confidence intervals from different groups suggests that there was no apparent trend in the results in favor of one group or the other. Sub-group analyses were performed on the basis of surgical approach (laparoscopic or open) and mesh weight (light or heavy). Summary of effect size and the associated forest plots were generated using Comprehensive Meta-Analysis software version 2.2 (Biostat, Inc.; Englewood, NJ, USA). All data are reported as pooled estimations of risk for hernia recurrence or infection. Results obtained on less than 5 studies are not reported.

Results

One-hundred and nine articles were identified of which 81 articles satisfied all inclusion criteria. A total of 10,022 patients operated for ventral hernia repairs were included in the analysis. Table S1 provides a descriptive summary of the included studies. Studies containing separate data on multiple subset populations are segregated in the appendix and treated as separate studies. In total, 81 studies resulted in 97 individual study data sets.

Analyses were performed to evaluate the pooled recurrence rate in ventral PET and PP hernia repair. Studies were separated based on mesh material (ie, PET or PP), approach (ie, open or laparoscopic), and mesh weight (ie, LW or HW). Due to insufficient papers and data, we were unable to report results on the following categories: recurrence rate in laparoscopic procedures using LW PET or PP meshes, recurrence rate using HW PP mesh, and seroma formation for both PET and PP mesh.

Recurrence rate

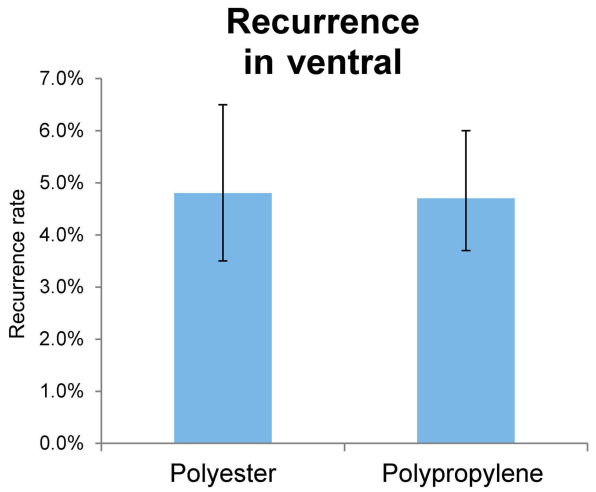
Overall recurrence rates are comparable between PET and PP with a recurrence rate of 4.8%, 95% CI [3.5–6.5] versus 4.7%, 95% CI [3.7–6.0] (Figure 1). Mesh weight did not have a significant impact on recurrence. Recurrence rates following hernia repair with LW PET mesh were 5.6%, 95% CI [3.7–8.5] compared to a 3.9%, 95% CI [2.4–6.4] rate with LW PP. (Figure 2). HW PET hernia repair recurrence rates were 4.0%, 95% CI [2.6–6.2] compared to 6.3%, 95% CI [4.5–8.8] with PP (Figure 3). Surgical approach did not have an impact on recurrence rate between laparoscopic and open repairs (3.3%, 95% CI [2.2–5.0] versus 5.2%, 95% CI [4.29–6.4] versus 4.9%, 95% CI [3.9–5.7], respectively). Recurrence rates among laparoscopic procedures were similar between PET and PP mesh (3.5%, 95% CI [2.0–6.0] and 3.0%, 95% CI [1.6–5.7]). Additional details are provided in Table 1.

Infection

The aggregate infection rate for PET and PP mesh was similar (3.5%, 95% CI [2.5–4.9] vs 5.0%, 95% [3.9–6.3]). The infection rate for laparoscopic procedures (1.6%, 95% [0.9–2.6]) was markedly lower than open procedures (5.2%, 95% [4.3–6.3]) when using either mesh (Figure 4). Mesh weight did not appear to have an impact on infection rates (4.8% LW vs 4.6% HW). Additional details are provided in Table 2.

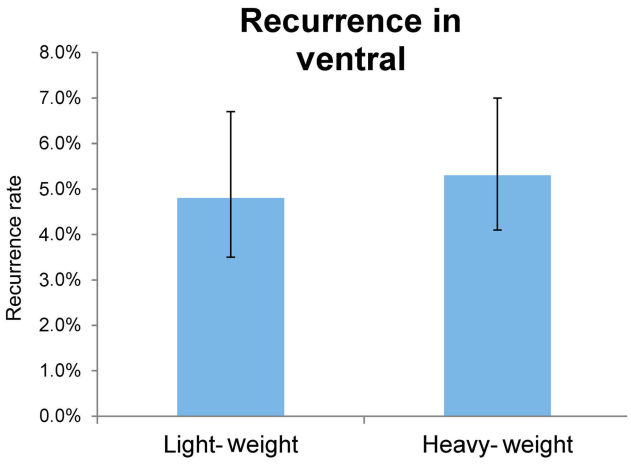
Other complications

Other complications, including hematoma and seroma, were not reported due to lack of data identified during the meta-analysis.



Ventral	N	# pat.	Recurrence rate
Polyester	37	4196	4.8%
Polypropylene	72	5826	4.7%

Figure 1 Recurrence rate according to material.

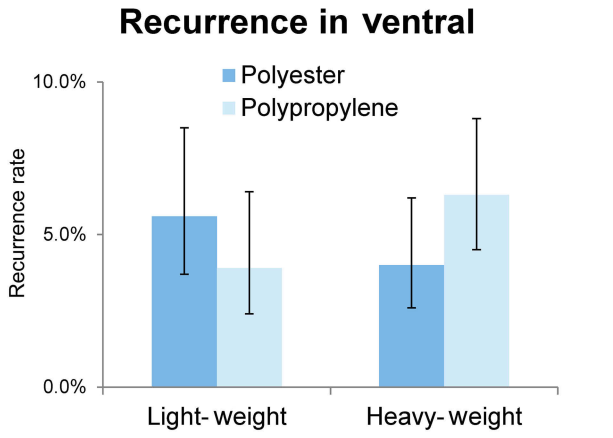


Ventral	N	# pat.	Recurrence rate
Light-Weight	35	3312	4.8%
Heavy-Weight	52	4917	5.3%

Figure 2 Recurrence according to mesh weight.

Discussion

Mesh materials differ in manufacturing process, composition, density, weave, and pore size. Despite these variations, there is no significant difference in recurrence or infection rates in ventral hernia repairs using either multifilament PET or monofilament PP mesh. Previously reported complications and variations in outcomes were not identified when comparing larger numbers of patients. Furthermore, there were no differences in recurrence rates or infections rates identified between mesh materials or within a subgroup analysis evaluating LW and HW meshes independently. Despite some variability in published recurrence rates among published studies, with occasional outliers, the rate of hernia recurrence for LW PET and LW PP is similar.[11] Patient selection, hernia characteristics, and patient comorbidities are likely to impact hernia repair outcomes beyond the influence of the mesh material alone and are likely to contribute to the variability in recurrence rates among studies. Nevertheless, mesh materials must have strength great enough to withstand physiologic intra-abdominal pressures, particularly when utilized as a bridge.[6] The etiologies of primary mesh failure with central hernia recurrence include mesh degradation, trauma during implantation, or use in situations in which abdominal forces exceed mesh strength.



Recurrence in ventral		N	n_pats	Recurrence rate
Polyester	Light-weight	17	1949	5.6%
	Heavy-weight	20	2247	4.0%
Polypropylene	Light-weight	18	1363	3.9%
	Heavy-weight	32	2670	6.3%

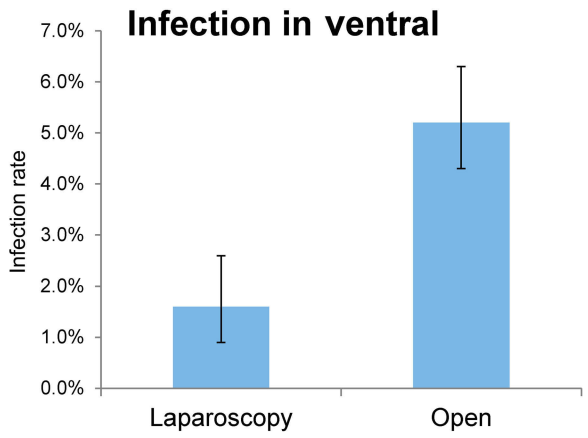
Figure 3 Recurrence rate according to material and mesh weight.

Hernia repair techniques are likely to impact hernia outcomes as well. Prior studies have demonstrated differences in hernia reoperation rates based upon mesh location with retrorectus meshes demonstrating the lowest reoperation rates.[13] Mesh location is equally important to mesh choice. This study was not able to evaluate the impact of mesh location on hernia repair outcomes due to the inability to clearly detect mesh location in the majority of patients.

Table 1 PET and PP recurrence rate. Study arms with less than N=5 papers were excluded from subgroup analysis

	PET		PP		PET+PP	
	Recurrence rate		Recurrence rate		Overall recurrence rate	
	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]
Ventral overall	37	4.8 [3.5–6.5]	72	4.7 [3.7–6.0]	109	4.7 [3.9–5.7]
Laparoscopic	14	3.5 [2.0–6.0]	12	3.0 [1.6–5.7]	26	3.3 [2.2–5.0]
Open	21	5.7 [3.9–8.3]	59	4.9 [3.9–5.7]	80	5.2 [4.2–6.4]
Lightweight (LW)	17	5.6 [3.7–8.5]	18	3.9 [2.4–6.4]	35	4.8 [3.5–6.7]
Laparoscopic LW	0	–	4	–	4	–
Open LW	17	5.6 [3.7–8.6]	14	4.6 [2.6–7.8]	31	5.2 [3.7–7.3]
Heavyweight (HW)	20	4.0 [2.6–6.2]	32	6.3 [4.5–8.8]	52	5.3 [4.1–7.0]
Laparoscopic HW	14	3.5 [2.0–6.1]	4	–	18	4.0 [2.5–6.5]
Open HW	4	–	27	6.0 [4.1–8.6]	31	6.0 [4.3–8.4]

Abbreviations: LW, Lightweight; HW, Heavyweight; PET, Polyester; PP, Polypropylene.



Ventral	N_studies	n_pat.	Infection rate
Laparoscopy	21	2198	1.6%
Open	67	6520	5.2%

Figure 4 Infection rate according to the surgical technique.

Laparoscopic hernia repair has been previously shown to be associated with a reduced incidence of mesh infections with similar hernia recurrence rates to open hernia repair.[14] Our overall infection rate using PET and PP mesh laparoscopically was 1%, 95% [0.5–2.2] and 2.2%, 95% [1.1–4.4], respectively, with overlapping confidence intervals. A comparative analysis of 79 laparoscopic PET mesh hernia repairs and 30 open extraperitoneal retrorectus PET mesh repairs reported infection rates less than 1% in laparoscopic cases and 13% for open procedures.[15] Regardless of mesh type, laparoscopic repairs are associated with fewer mesh infections than open repairs, likely related to the avoidance of a laparotomy incision directly overlying the mesh.

The inherent limitations of this study are related to the quality and heterogeneity (in terms of design, follow-up, population, period, etc.) of the included studies. Studies including randomized controlled trial but also single-arm cohort studies with a minimum of 1-year follow-up were included to capture the incidence of both hernia recurrence and mesh infection. Prior studies have demonstrated that the majority of hernias occur within 2 years, and recurrence rates continue to increase beyond the 2-year postoperative interval.[16] In the current analysis, inclusion of studies with follow-up duration of 1 year may underestimate the incidence of long-term recurrence. However, the similarity in recurrences seen in each of the mesh type would lead the authors to believe that long-term recurrence rates would also be similar. Publications including results in figure form without infection or recurrence rates stated within the text of the publication were not included within the analysis. Analyses for mesh brand, weight, or surgical approach were not performed due to insufficient number of studies. Various mesh brands are included in analyses, grouped by material type and mesh weight. Although similarity exists between mesh materials, the manufacturing processes for each product include unique weaves, pore size, and properties that may impact outcomes. Furthermore, this study was unable to evaluate the impact of mesh position location upon outcomes. Variability in reporting of mesh location in the included studies did not allow for us to evaluate the impact of mesh location upon hernia recurrences based upon mesh type. Accordingly, this study was unable to assess the impact of mesh location upon hernia mesh infection rates. The impact of factors such as

Table 2 PET and PP infection rates. Subgroups with less than N=5 papers were excluded from analysis

	PET		PP		PET+PP	
	Infection rate		Infection rate		Overall infection rate	
	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]
Ventral overall	30	3.5 [2.5–4.9]	60	5.0 [3.9–6.3]	90	4.4 [3.6–5.4]
Laparoscopic	11	1.0 [0.5–2.2]	10	2.2 [1.1–4.4]	21	1.6 [0.9–2.6]
Open	18	4.8 [3.3–6.7]	49	5.5 [4.3–6.9]	67	5.2 [4.3–6.3]
Lightweight (LW)	14	4.9 [3.2–7.5]	15	4.9 [2.9–7.9]	29	4.8 [3.4–6.7]
Laparoscopic LW	0	–	2	–	2	–
Open LW	14	5.1 [3.5–7.2]	13	5.4 [3.2–9.0]	27	5.1 [3.6–7.1]
Heavyweight (HW)	16	2.2 [1.3–3.7]	26	6.5 [4.7–9.0]	42	4.6 [3.4–6.2]
Laparoscopic HW	11	1.1 [0.5–2.1]	4	–	15	1.3 [0.7–2.6]
Open HW	4	–	21	6.5 [4.4–9.4]	25	6.0 [4.3–8.4]

Abbreviations: LW, Lightweight; HW, Heavyweight; PET, Polyester; PP, Polypropylene.

undermining skin flaps or subcutaneous mesh placement, which has been associated with poor outcomes, could not be addressed.[17] Additional known risk factors for hernia recurrence and complications including smoking status, history of COPD, diabetes, and BMI were unable to be addressed in this review due to inconsistent reporting. Finally, the literature review was quality controlled, and some manuscripts were excluded from using the same data. However, the analysis datasets may contain some patient data in duplicate though the authors believe this would only be in a very limited number of patients.

Conclusion

Ventral hernia repairs can be safely performed using either monofilament PP or multifilament PET mesh with comparable rates of mesh infection and hernia recurrences. Each device has characteristics that require the identification of proper surgical technique (ie, laparoscopic versus open: retrorectus versus underlay or onlay) in an effort to balance the risk of infection and recurrence. Mesh selection should be tailored to each patient, subpopulation, and situation, with a continuation of head-to-head device trials to garner more long-term data.

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Disclosure

PB and ML are both employed by Medtronic (Trevoux, France; formerly Covidien). PB also reports being a medtronic employee. This literature review is comparing mesh materials, medtronic like other manufacturers is selling Polypropylene and polyester meshes. Dr Scott Roth reports grants, personal fees from Bard, personal fees from Allergan, stock options from Miromatrix, during the conduct of the study; grants, personal fees from Bard, personal fees from Allergan, stock options from Miromatrix, outside the submitted work. The authors report no other conflicts of interest in this work.

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Supplementary materials

Table S1 Full list of study data sets

First author	Year	Material	Mesh weight	Surgical approach	Number of patients	Mean follow-up (months)	Number of recurrences	Number of mesh-related recurrences	Number of infections
Adloff M	1987	PET	LIGHT	OPEN	130	96	6	6	7
Ahmad M	2003	PP	HEAVY	OPEN	27	26	0	0	1
Alkhoury F	2011	PP	HEAVY	LAP	141	40	7	–	4
Ammaturo C	2004	PET	HEAVY	–	26	15	1	–	–
Ammaturo C	2010	PET	HEAVY	OPEN	103	42	6	1	4
Armananzas L	2014	PP	HEAVY	LAP	53	12	2	–	0
Arnaud J	2003	PET	HEAVY	LAP	51	12	1	–	–
Arroyo S A	2002	PP	–	OPEN	213	64	2	–	3
Balique	2005	PET	HEAVY	OPEN	51	48	11	1	4
Bansal V	2011	PP	–	LAP	35	16.3	0	0	0
Basoglu	2004	PET	LIGHT	OPEN	61	52.8	6	–	6
Becouarn	1996	PET	LIGHT	OPEN	160	36	7	0	4
Bensaadi H	2014	PP	LIGHT	OPEN	41	36	6	–	2
Berrevoet F	2010	PP	–	OPEN	205	36	7	–	12
Berrevoet F	2011	PP	LIGHT	OPEN	56	48.8	2	–	0
Berrevoet F	2009	PP	LIGHT	LAP	114	27	4	–	–
Bessa S	2013	PP	HEAVY	OPEN	80	49.9	1	–	–
Bhanot P	2013	PP	LIGHT	LAP	100	50	0	0	0
Bingener J	2004	PP	HEAVY	LAP	30	14	1	–	0
Bracci F	2008	PP	–	OPEN	26	24	0	0	0
Briennon	2011	PET	HEAVY	OPEN	280	12–108	9	0	12
Champetier	1978	PET	LIGHT	OPEN	51	21	1	0	–
Champetier	1990	PET	LIGHT	OPEN	54	42	5	–	4
Chelala E	2010	PET	HEAVY	LAP	608	52	25	9	0
Chowbey P	2000	PP	–	LAP	202	34.8	2	–	5
Colon MJ	2011	PET	HEAVY	LAP	50	12	1	–	0
Conze	2005	PET	LIGHT	OPEN	34	24	5	–	3
de Ruiter P	2005	PP	–	OPEN	46	60	7	–	3
del Pozo M	2003	PP	HEAVY	OPEN	32	23.6	0	0	0
Eriksen	2011	PET	HEAVY	LAP	19	16	0	0	1
Fei Y	2012	PP	LIGHT	OPEN	26	14.5	0	0	1
Gherardi	2013	PET	HEAVY	LAP	118	66	4	0	0
Ghnnam WM	2009	PP	HEAVY	OPEN	29	30	0	0	2
Gleysteen J	2009	PP	HEAVY	OPEN	75	66	15	–	9
Gomez R	2001	PP	HEAVY	OPEN	37	42	6	6	–
Gronnier C	2012	PP	HEAVY	OPEN	121	24.6	17	–	12
Gutierrez de la P C	2003	PP	HEAVY	OPEN	50	36	0	0	1
Guzman-Valdivia G	2008	PP	LIGHT	OPEN	25	12	2	–	2
Guzman-Valdivia G	2001	PP	–	OPEN	50	24	0	0	–
Hadi H	2006	PP	LIGHT	OPEN	51	15	1	–	2
Hamy	2003	PET	LIGHT	OPEN	350	97.2	11	11	14
Han J	2007	PP	HEAVY	OPEN	48	32	2	–	–
Hasbahceci M	2014	PP	–	OPEN	25	42.6	1	–	0
Iversen E	2010	PP	LIGHT	OPEN	152	15.6	4	–	4
Janes A	2004	PP	LIGHT	OPEN	27	24	1	–	0
Johanet	2005	PET	HEAVY	OPEN	122	12	3	–	2

(*Continued*)

Table S1 (Continued).

First author	Year	Material	Mesh weight	Surgical approach	Number of patients	Mean follow-up (months)	Number of recurrences	Number of mesh-related recurrences	Number of infections
Korenkov M	2002	PP	HEAVY	OPEN	39	16	3	–	4
Kulacoglu H	2012	PP	–	OPEN	100	12	0	0	3
Lahon	2009	PET	HEAVY	LAP	71	13	13	0	1
Lepère M	2008	PET	HEAVY	LAP	29	12	1	–	–
Lermite E	2004	PET	HEAVY	LAP	26	33	0	0	1
Lewis R	1984	PP	HEAVY	OPEN	50	30	3	–	2
Liu F	2011	PP	LIGHT	OPEN	36	28	0	0	4
Luijendijk R	2000	PP	HEAVY	OPEN	84	26	19	5	–
Machairas	2004	PET	LIGHT	OPEN	43	54.4	4	3	3
Mahmoud Uslu H	2006	PP	HEAVY	OPEN	291	55	6	–	8
Maman D	2012	PP	–	OPEN	40	40	0	0	–
Martin-Duce A	2001	PP	HEAVY	OPEN	284	72	4	–	11
Mathonnet	1998	PET	LIGHT	OPEN	99	12	4	–	6
McCarthy JD	1981	PP	HEAVY	OPEN	25	48	2	–	1
Mehrabi M	2010	PET	LIGHT	OPEN	176	96	2	2	3
Moreno-Egea	2004	PET	HEAVY	LAP	86	42	3	3	0
Moreno-Egea	2004	PET	HEAVY	LAP	127	64	5	–	1
Moreno-Egea	2008	PET	HEAVY	LAP	55	18	1	1	0
Moreno-Egea	2013	PET	HEAVY	LAP	51	24	0	0	–
Moreno-Egea A	2010	PP	LIGHT	OPEN	50	48	0	0	3
Murtaza, B	2009	PP	–	OPEN	33	15.78	0	0	1
Nardi MJ	2012	PET	HEAVY	LAP	87	12	2	–	1
Notash	2007	PET	LIGHT	OPEN	51	67.6	4	–	–
Novitsky Y	2006	PP	–	OPEN	128	28.1	4	0	4
Olmi S	2006	PET	HEAVY	LAP	178	29	4	–	1
Paajanen H	2004	PP	HEAVY	OPEN	84	36	4	–	–
Petersen S	2004	PP	HEAVY	OPEN	130	20	5	–	6
Piardi T	2010	PP	–	OPEN	25	75	1	–	–
Poelman, M	2010	PP	HEAVY	–	101	64	16	–	22
Poghosyan T	2012	PET	LIGHT	OPEN	262	58	8	8	2
Prasad P	2011	PP	–	LAP	68	22.7	2	–	0
Qadri S	2010	PP	–	OPEN	40	26	1	–	6
Quarmby C	2001	PP	HEAVY	OPEN	32	35.4	1	–	9
Rives	1985	PET	LIGHT	OPEN	218	36	7	0	18
Rosen MR	2014	PET	LIGHT	OPEN	36	13	8	8	–
Rosen MJ	2009	PET	HEAVY	–	109	14	3	–	5
Rosenberg J	2008	PP	LIGHT	LAP	49	17	0	0	1
Sauerland S	2005	PP	HEAVY	OPEN	74	60	4	–	2
Schmidbauer S	2005	PP	HEAVY	OPEN	69	92	2	–	2
Shukla V	2005	PP	–	OPEN	55	37	0	0	2
Steele S	2003	PP	–	OPEN	58	50.6	15	–	2
Stoikes N	2013	PP	–	OPEN	50	19.5	0	0	3
Sugerman H	1996	PP	HEAVY	OPEN	98	20	4	–	17
Trivellini G	2001	PP	–	OPEN	270	32.5	1	–	1
van't R	2002	PP	HEAVY	LAP	25	16	4	–	1
Veyrie N	2013	PET	LIGHT	OPEN	61	47	3	–	0
Vijayasekar C	2008	PP	–	OPEN	42	31	4	–	1
Vychnevskaia K	2010	PP	LIGHT	OPEN	101	28.5	2	–	–

(*Continued*)

Table S1 (Continued).

First author	Year	Material	Mesh weight	Surgical approach	Number of patients	Mean follow-up (months)	Number of recurrences	Number of mesh-related recurrences	Number of infections
Welty G	2001	PP	HEAVY	OPEN	115	24	11	–	–
Wheeler	2009	PET	LIGHT	OPEN	90	46	6	–	10
Yildirim M	2010	PP	HEAVY	OPEN	25	28	0	0	3

Abbreviations: PET, Polyester; PP, Polypropylene; LAP, Laparoscopic.