



Prosthetic Repair in the Treatment of Groin Hernias

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Prosthetic repairs are an important development in herniology because of their excellent results. Reinforcement or replacement of the fascia transversalis is performed by interposition of a synthetic mesh between muscles and peritoneum aiming at the restoration of the tightness of the abdominal wall against the intra-abdominal pressure. All synthetic materials are not equally appropriate; Marlex mesh has been used exclusively in this report. The midline preperitoneal way allows the placement of large bilateral prostheses kept in place by intra-abdominal pressure; they need not be fixed nor associated with any suturing of the hernial hole. This is a very easy operation even in multirecurrent hernias. Because of the more disagreeable septic accidents after prosthetic repair, an important question is related to its indications, which must be selective. Randomized studies, comparing diverse techniques, are unlikely to lead to an exclusive choice because hernias are polymorphous lesions and also because of the time lag-factor and suturing must be followed up for 20 years. In socioeconomic terms, a prosthesis is the most appropriate treatment for hernias liable to recur. Nowadays it is impossible to reject the remarkable possibilities offered by prostheses in hernial surgery after the developments of the past 20 years.

KEY WORDS: Groin hernia - Prosthetic repair.

Ethics, deontology and social economics are always encouraging the surgeon to be heedful of the progress made in basic surgery, among which, the perfecting of synthetic materials that re-inforce the abdominal wall has been at the origin of an important evolution in the surgery of groin hernias, more especially in our country. We are at present able to assess the utilisation of Dacron mesh (the French operation) in this field, this being a direct result of our experience over the last twenty years.

Principles, materials, methods

Bassini² had already underlined the importance of deep parietal repair; with Fruchaud,^{3,4} we admit that all groin hernias pass through the musculo-pectineal hole. The treatment of these hernias finds itself unified, if not simplified, and must necessarily include a restoration of the musculo-fascial layer in the area of the orifice. One can re-inforce or efficiently replace

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the transversalis fascia, by interposing a piece of Dacron mesh between the peritoneal sac and the muscular wall, and at the same time largely over-lapping the deep hernia hole in all directions; when the peritoneal sac returns into its place, the prosthesis is applied by intra-abdominal pressure on the deep face of the wall, then immobilized by the colonization of the connective tissue through its mesh. One can consider that the synthetic mesh becomes, then, a kind of endo-abdominal neo-fascia that definitely prevents a recurrence. The eventual need of stitching the prosthesis not only depends on its dimensions, but also on the approach used for its application.

In line with Rives,¹² Mersuture Dacron mesh is the material that we have used exclusively for some twenty years. This material (marketed in North America under the name of Mersilene mesh) has comparable qualities to those of other materials currently used, such as Marlex mesh (in North America), Rhodergon 8000 (in France). On the other hand, one must not confuse these with other very different types of materials, such as Vicryl mesh (absorbable in 4 weeks, therefore, bringing about only a temporary support to the stitching), Silastic cloth, and especially Rhodergon-Velvet (combining a waterproofed Silastic piece and a synthetic velvet). We strongly advise against the use of these last 2 mentioned materials for the mending of groin hernias. J. Petit and J. P. Arnaud experiments^{9,1} have established that Dacron mesh was well tolerated by the tissues and that it provoked only a moderate inflammatory reaction, as well as an important fibroblastic reaction; our already well tried clinical experience is in agreement with their results and encourages us to keep on using this mesh.

The approach to be adopted in surgically repairing the weak area of the transversalis fascia, while using Dacron mesh, must be examined when considering the operation to be done: (1) The inguinal way, the oldest method, allows the placing of moderate sized pieces. (2) The abdominal approach, well known these days, is the one that allows, among other advantages, the use of a large re-inforcing prosthesis of the transversalis fascia; here, we are not talking about, of the transperitoneal approach that allowed Marcy, followed by Laroque (1919), to close the deep hernial orifice, but of the pre-peritoneal approach, whose inventors are quoted by Nyhus,^{7,8} sometimes called the Cheatle-Henry approach,⁵ whose merits were underlined by Rives in France.

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We have tried 2 methods using Dacron mesh: (1) The patch by the inguinal approach, a method perfected and described on several occasions by Rives,¹²⁻¹⁵ right up to its current form. (2) The large prosthesis re-inforcing the endo-abdominal fascia by a medial pre-peritoneal approach, a method that we have improved and used since 1968. We have often described it in several papers¹⁷⁻²⁴ and will not again mention its technical aspects. That which distinguishes the 2 previously mentioned methods, when using Dacron mesh in a pre-peritoneal situation, can be summarised as follows:

— When dealing with the inguinal patch: inguinal approach; moderate sizes of the piece, that theoretically lessens the septic risk, perhaps increased by the more direct approach of the insertion site; gestures orientated towards parietal re-inforcement, that bring about the need to fix the patch to the wall.

— As to the large re-inforcing prosthesis of the transversalis fascia: medial sub-umbilical approach, a very large sized piece, placed in a huge bilateral retrofascial cleavage, neither a fixation of the prosthesis, nor a parietal mending, but only a large envelopment of the visceral sac in an artificial fascia of Dacron mesh. Rignault^{11, 16} proposed the use of the Pfannenstiel incision, to realize the placing of a unilateral piece of Dacron mesh, split to allow the chord to pass through, and fixed by 3 low absorbable stitches encircling the deep weak spot.

Results

We have recently reviewed a series of 1,522 patients with 2,108 groin hernias operated from 1970 to 1984 in order to compare—using a computerized study of 140 items—the results of 4 techniques in our hands: Bassini operation (BO), Cooper ligament repair (CLR), Inguinal patch (IP) and Pre-peritoneal prosthetic repair (PPR). Patients were 16-103 years old, mean age were 55.8 in males and 61.5 in females. Sex ratio is 5.32 M./1 F. The anatomoclinical type breakdown is: 40.1% indirect hernias, 30% direct hernias, 6.6% groin eventrations, 6.3% femoral hernias, 17% diverse or unprecised hernias; incidentally 265 hernias (12.6%) were recurrent and 141 patients (9.7%) were operated for acute complications. The breakdown by used techniques is the following: 99 BO, 549 CLR, 213 IP, 604 PPR; 42 modified Shouldice operations were also performed.

Post-operative course. (1) A straight forward course was noted in: 91 BO (92.1%), 525 CLR (95.1%), 191 IP (89.9%), 572 PPR (94.7%); hence similarly favorable rates have been observed for every technique, while remarking that BO was used for some complicated hernias and PPR for the most unfavorable cases. (2) Hematoma rates reported are: 2.2% after BO, 2.8% after CLR, 4% after IP and 3.2% after PPR; so no important difference between the techniques. (3) Sepsis rates observed are: 5.6% after BO, 2.2% after CLR, 6.1% after IP and 2.1% after PPR; while remarking that BO has been used in complicated hernias. (4) Other complications reported are: 16 chest infections (8 after raphies, 7 after PPR, 1 after IP), 4 phlebitis (3 CLR, 1 PPR) and 2 pulmonary embolisms (1 CLR, 1 PPR). (5) 20 deaths occurred during the first post-operative month (1.3%): related to 14 raphies (2%) and 6 PPR (0.7%) in elder people with complicated cases. (6) Hospitalization lengths are reported in Table 1 which makes clear that using Dacron does not much lengthen the mean hospital stay, mostly when taking account of the use of PPR in the most unfavorable cases. Incidentally, these lengths of hospitalization will probably startle our North American colleagues; although French surgeons aim to reduce the length of the post-operative hospital stay for economic reasons, they have to consider different problems. (7) Comparison of "off work" periods for each of the operations is

TABLE I.—Comparison of length of hospital stay of patients operated on by the four techniques (N=2108).

Time (days)	Technique			
	B.O. (%)	C.L.R. (%)	I.P. (%)	P.P.R. (%)
<7	68.4	57.9	30.5	19.4
8-12	25.5	37.1	57.7	68.3
>13	6.1	5.9	11.9	12.2
Median length of stay	7.3 days	7.7 days	9.2 days	9.7 days

TABLE II.—Comparison of time off from work of patients operated on by the four techniques (N=2108).

Time (weeks)	Technique			
	B.O. (%)	C.L.R. (%)	I.P. (%)	P.P.R. (%)
1-4	23.8	33.9	32.7	42.3
5-8	57.1	50.3	44.9	45.5
>9	19.1	15.8	22.4	12.2

reported in Table 2 showing that prostheses are "responsible" not only for the higher rate of shorter "off work" periods, but also for the lower proportions of the longer ones.

Follow-up. 1,330/1,522 patients were checked up (83.7%) after 1-10 years. (1) 113 recurrences were observed (8.5%): 22.5% after BO, 15.3% after CLR, 10.7% after IP and 1.4% after PPR; we must underline the circumstances in which recurrences occurred after PPR: too small or split prostheses. It should also be emphasized that the recurrences after 1 year reached up to 27.8% of their total number after BO, 31.4% after CLR, while there was no worsening of results for Dacron repairs. (2) Among the sequelae observed are: 4 testicular atrophies and 2 hydroceles, all of them after inguinal approach. (3) Lastly, the late migration in the bladder of a pre-peritoneal prosthesis, placed during a prostatectomy, again obliges us to forbid the association of septic gestures and prosthetic repair. Anyhow, that computerized study of our series brings out the favorable results of the pre-peritoneal prosthetic repair of groin hernias when compared with other techniques in our hands.

Tables 3 to 5 report some results obtained by other surgeons using either a single technique or multiple procedures, chosen for the precise definition of their techniques and follow-up. Considering the whole of them, it should be underlined that their results do not contradict our own cheering observations related to the results of prosthetic repair.

Discussion

1. The septic risk, brought about by the implantation of heterogenous material, must be underlined. If sepsis occurs, it is not a reject, but a result of a bacterial contamination. A strict discipline must be the rule, from start to finish, when taking over a patient: (1) Before the operation, by carefully decontaminating the skin, eventually doing away with Dacron in the case of a persistent der-

TABLE III.—*Recurrence rate after raphy repairs following surgeons using multiple techniques.*

Authors	Techniques	No. operated hernias	Control rate	Follow-up duration (years)	Recurrence rate
Berliner (1983)	Bassini, MacVay	723	93.7%	4-9	11.5%
	F.T. plasty	591		2.5	0.7%
	Shouldice	326			0.3%
Doran (1975)	MacVay	20	97%	2	15-20%
	Bassini	83			8.7-13%
Hagan (1976)	Halsted	766			6.7%
	Bassini				2.9%
	Ferguson				4.5%
	MacVay				6.6%
	Lytte				3.6%
Jones (1980)	MacVay	74		2	10.9%
	Shouldice	222		2	4.5%
Jungdahl (1974)	Nyhus	402	90.3%	1-5	6.4-16.7%
	Bassini		88.9%		1.5-16.7%
Lubeth (1978)	MacVay	800	52.4%		3.9%
	Bassini	25			20%
Marsden (1980)	Morisson	265 + 75 + 15			Ext. Obl. H. 6.5 %
	Bassini (nylon)	235 + 101 + 31			Direct H. 8%
	Bassini (gut)	104 + 19 + 3			Recurr. 20%
Stoppa and Warlaumont (1983)	Bassini	91	85.7%	1-10	22.5%
	MacVay	373	85.1%	1-10	15.5%
Telle (1969)	Bassini	612			10.1%
	Halsted	88			13.9%
	MacVay	235			14.4%
	MacVay + Halsted	33			12.1%
<i>Total</i>		1124			10.8%

TABLE IV.—*Recurrence rate after inguinal patch.*

Authors	Techniques	No. operated hernias	Control rate	Follow-up duration (years)	Recurrence rate
Bapat (1979)	Steel	95	84.2%	0.5-5.5	1%
Barthes (1978)	Nylon	273	/	3	9.9%
Cerise (1980)	Dacron	100	100%	1-4.5	1%
Courtot (1981)	Rhodergon	31	/	1	7%
Martin (1982)	Marlex	365	/	1-10	0%
Nahas (1979)	Nylon	51	/	/	2%
Notaras (1979)	Dacron	246	/	1-8	0.4%
Piper (1980)	Skin	246	67.7%	/	12.2%
Rives (1980)	Dacron	65	/	/	0%
Rives (1984)	Dacron	183	66.1%	1-9	1.6%
Saliba (1980)	Dacron	204	/	/	0%
Snidjers (1981)	Teflon	150	93%	1-8	2.7%
Stoppa and Warlaumont (1983)	Dacron	208	87.3%	1-10	10.9%
Usher (1962)	Marlex	54	44.4%	1	10.2%
Zagdoun (1969)	Nylon	185	30%	1-7	7%

matosis. (2) During the operation, by applying the rules of orthopaedic surgery, by a well disciplined team and the use of antiseptic products in the operating field. (3) After the operation, we suggest: avoid all bandages (in order to more easily control the scar), re-open the wound when faced with any kind of superficial inflammation, even more

so when a deeper sepsis occurs as related to the prosthesis. At first, it never seemed necessary to us to remove a porous prosthesis when the touching abscess could be correctly drained; however, some "second hand" patients needed several surgical cleanings when not having been treated at the right time; 3 of them had to undergo a total removal

TABLE V.—*Recurrence rate after preperitoneal prosthetic repairs.*

Authors	Techniques	No. operated hernias	Control rate	Follow-up duration (years)	Recurrence rate
Blondiaux (1979)	Teflon, Midline Approach	91	52.7%	0.5-3.5	0%
Brismoutier (1980)	Silicon, Midline Approach	101	/	4	6%
Calne (1967)	Dacron, Pfannenstiel	30	/	1-7.5	13.3%
Detrie (1976)	Nylon, Midline Approach	50	/	0.5-4	0%
Fagot (1979)	Dacron, Midline Approach	29	100%	0.5-3	1.3%
Gosset (1972)	Rhodergon-Velvet, Midline	7	/	2	0%
Read (1975)	Marlex, Midline Approach	83	/	4	7%
Rignault (1983)	Dacron, Pfannenstiel	658	86.3%	4	4.6%
Saint Julien in Salinier (1983)	Dacron, Midline Approach	309	63%	0.5-6	2.9%
Stoppa (1973)	Dacron, Midline Approach	168	88.1%	1-7	3.3%
Stoppa and Warlaumont (1983)	Dacron, Midline Approach	285	91.3%	1-10	1.4%
Stoppa and Warlaumont (1985)	Dacron, Midline Approach	604	94.7%	1-10	1.2%
Vandamme (1985)	Teflon, Midline Approach	100	100%	1-2	0%

of the prosthesis. Do not forget the important information shown by the echographic examination of the deep post-operative hematomas.

2. The use of Dacron, when dealing with the mending of groin hernias, answers the criteria called for in the treatment of a straightforward illness: (1) It is a logical method: the Dacron mesh acts as an untearable piece of artificial endoabdominal fascia of a more or less large size, that prevents recurrence and, in the case of our large re-inforcing prosthesis, can, at the same time, close all weak points of the lower part of the abdominal wall when there are several hernias associated with eventrations. (2) The mildness of the method brings about a simple post-operative course. We personally consider that the advantages of the large re-inforcing prosthesis are: its simplicity, due to a fast opening; the non bleeding cleavage of the retro-fascial space; the good exposure of the hernial areas; the facility of the parietalization of spermatic chord elements; the absence of a dangerous gesture (no threats for the ilio-femoral vessels, the crural nerve, nor for the superficial groin nerves, nor again for the funicular vessels); the non-need of any closure of the hernial orifice and of any fixing of the prosthesis. All these lead to a short length of operation (30 to 50 min for a bilateral hernia). Whilst we advise against loco-regional anaesthesia, due to the increasing septic risk incompatible with the use of a prosthesis, we recommend peridural anaesthesia for patients who have a respiratory risk. In conclusion, it is not a question of a major operation for a simple illness, but an operation correctly adapted, both, to the cure of certain hernias that have become more serious, as well as making sure that they do not re-occur. (3) As to efficiency, it has been proved not only by our own results, but also by the experiences of other surgeons.^{10-16 24}

3. What can we say concerning recurrences after the use of Dacron mesh, and especially the use of a large re-inforcing prosthesis of the visceral sac? In the case of our 6 personal recurrences after using large prostheses, we have

found that the reason was that too small Dacron pieces had been used, and that the recurrence went by the side of its lower or lateral edge; re-operation by the inguinal approach allowed an efficient fixation of the edge in question to the fascia iliaca or to the Cooper ligament. On the other hand, one must point out that the failures of the inguinal patch can easily be recuperated, without any particular difficulty, by the use of a large prosthesis using a pre-peritoneal high approach.

4. What are, at present, reasonable indications of Dacron mesh when dealing with groin hernia repairs? That is one of the most delicate points to discuss, due to the more disagreeable problems raised by septic accidents when a prosthesis has been used. One must not systematically use Dacron mesh for all hernia repairs, but limit the indications to the cases that have the risk of recurrence after a repair by kelotomy. Even though the inguinal patch is considered by J. Rives as a routine technique susceptible of solving all problems, personally we find that this operation is more difficult to achieve than the placing of a large re-inforcing prosthesis of the endo-abdominal fascia, by a pre-peritoneal medial approach: a fast operation, interesting for elderly hernia sufferers, often carriers of huge hernias sometimes bilateral ones. Let us insist on the need to achieve it, using our method of handling the piece by 8 long Rochester forceps.

Considering the risk of recurrence, the useful indications of Dacron mesh concern a fair number of operated patients:

- men over the age of fifty, or younger men when they have to make certain physical efforts;
- multiple hernias: an association of different types of groin hernias, bilateral hernias, hernias associated to one or several lower eventrations;
- hernias that are naturally complicated: sliding hernias, huge inguino-scrotal hernias, recurring or multi-recurring hernias;
- such circumstances obliging the surgeon to respect

greater responsibilities while assuring a guaranteed result: obesity, advanced age, cirrhotic ascitis, etc.

Besides the subjective preferential indications as to the inguinal approach or the abdominal one, here are some criteria that allow a logical if not exclusive orientation: (1) The inguinal approach can be chosen when loco-regional anaesthesia is obligatory, in cases of major obesity, in rare cases of recurrence after the use of a large reinforcing prosthesis of the endo-abdominal fascia. (2) The abdominal approach would be preferable each time that one wishes to perform a fast operation (a bilateral hernia in elderly or debilitated patients), in order to treat recurrences after an inguinal patch; finally, the same approach is necessary when the ilio-pubic tract and the Cooper ligament are destroyed (multi-recurrent hernia).

When to use the classical techniques, or especially the very good Bassini procedure, or again, its fashionable side-shoot, the Shouldice technique? Not only when the prostheses are forbidden due to a septic risk or to an emergency (strangulation), or when operating conditions are too bad, but also for small hernias in young operated patients who represent a fair number. It has to be stressed, in this field, as these techniques are widely used in France, that the Bassini or MacVay procedures have to be performed exactly as the authors have described them. As far as we are concerned, we do not hesitate to employ the Bassini technique for indirect unilateral groin hernias in men under the age of 30, and the MacVay operation for direct unilateral groin hernias in men from 40 to 50 years old, or for femoral hernias. Finally, the very weak risk of recurrence after primary hernial surgery in very old people, in Warlaumont's study,²⁵ allows us an overlapping suture of the musculo-fascial layer, under a local anaesthesia, being the same for patients having a severe respiratory insufficiency.

Conclusion

Without ruling out classical techniques used in simple cases, we frequently use Dacron in the treatment of groin hernias, especially, the large bilateral prosthesis placed in position by a pre-peritoneal sub-umbilical medial approach, nonattached, held in place by the intra-abdominal pressure. The Dacron mesh must be used in large pieces, comparable to a kind of unabsorbable endo-abdominal fascia, that virtually prevents all recurrences. Looking back on our experiences, the comparative results of the 4 different techniques as applied to 2,108 groin hernias are witnesses in favour of prosthetic repair. The 2 main methods using Dacron mesh impose on the surgeon careful learning and rigorous performance; the precautions aiming to eliminate or to treat septic incidents are especially important, since septic incidents are far more disagreeable when using a prosthesis. It is quite natural that the surgeon should make every effort to avoid sepsis, since he can do nothing else, to improve the resistance of inguinal structures whose deterioration impeaches the success of repairs.

A hundred years after the famous Bassini, it is not possi-

ble, these days, to ignore the extraordinary possibilities offered by prostheses in groin hernia surgery.

References

1. Arnaud JP, Eloy R, Weill-Bousson M. *et al.* Résistance et tolérance biologique de 6 prothèses inertes utilisées dans la réparation de la paroi abdominale. *J Chir* 1977; 113:85-100.
2. Bassini E. 100 casi di cura radicale dell'ernia inguinale operata col metodo dell'autore. *Arch Soc Ital Chir* 1888; 5:315.
3. Fruchaud H. Anatomie chirurgicale des hernies de l'aîne. Doin Edit, Paris, 1956.
4. Fruchaud H. Traitement chirurgical des hernies de l'aîne. Doin Edit, Paris, 1957.
5. Henry AK. Operation for femoral hernia by a midline extraperitoneal approach. *Lancet* 1936; 531-533.
6. MacVay CG. Groin hernioplasty-Cooper ligament repair. In: Nyhus LM, Condon RE (eds.) "*Hernia*", JB Lippincott Co, Philadelphia & Toronto, 1978; 179.
7. Nyhus LM, Harkins HN. *Hernia*. 1st ed., JB Lippincott Co, Philadelphia & Toronto, 1964.
8. Nyhus LM, Condon RE. *Hernia*. 2nd ed., JB Lippincott Co, Philadelphia & Toronto, 1978.
9. Petit J, Stoppa R. Evaluation expérimentale des réactions tissulaires autour des prothèses de paroi abdominale en tulle de dacron. *J Chir* 1974; 107:667-673.
10. Pietri P, Gabrielli F, Marangoni O *et al.* Impiego della rete di Mersilene per via pre-peritoneale nelle recidive di ernia inguinale. *Min Chir* 1982; 37:315-318.
11. Rignault D, Dumeige F. Pose de 2 plaques par voie de Pfannenstiel pour hernie bilatérale. *J Chir* 1981; 118:673-676.
12. Rives J, Stoppa R, Fortesa L, Nicaise H. Les pièces en dacron et leur place dans la chirurgie des hernies de l'aîne. *Ann Chir* 1968; 22:159-171.
13. Rives J, Lardennois B, Hibon J. Traitement moderne des hernies de l'aîne et de leur récurrence. *Encycl Med Chir Paris "Techniques chirurgicales: appareil digestif"*, 3, 24, 5, 40010.
14. Rives J, Fortesa L, Drouard F, Hibon J. La voie d'abord abdominale sous-péritonéale dans le traitement des hernies de l'aîne. Son histoire, ses indications, ses limites. A propos de 104 observations. *Annales de Chirurgie* 1978; 32:245.
15. Rives J, Lardennois B, Flament JB, Convers G. La pièce en tulle de dacron, traitement de choix des hernies de l'aîne de l'adulte. *Chirurgie* 1973; 99:564-575.
16. Salinier L. Etude comparative du traitement des hernies inguinales par prothèses. A propos de 309 observations. Thèse Doct Med, Bordeaux II, 1983; 95 p. dact.
17. Stoppa R, Petit J, Abourachid H. Procédé original de plastie des hernies de l'aîne: l'interposition sans fixation d'une prothèse en tulle de dacron par voie médiane sous-péritonéale. *Chirurgie* 1973; 99:119-123.
18. Stoppa R, Abourachid H, Duclay C. Plastie des hernies de l'aîne. L'interposition sans fixation de tulle de dacron par voie médiane sous-péritonéale. *Nouv Pr Médicale* 1973; 2(29):1949-1951.
19. Stoppa R, Henry X, Verhaeghe P. La place des prothèses réticulées non résorbables dans le traitement chirurgical des hernies de l'aîne. *Chirurgie* 1981; 107(5):333-341.
20. Stoppa R, Warlaumont C, Verhaeghe P. Preperitoneal placement of Dacron mesh in the repair of groin hernias. *Surg Rounds* 1983; 6(4):38-51.
21. Stoppa RE, Warlaumont C, Verhaeghe P. Tulle de dacron et cure chirurgicale des hernies de l'aîne. *Chirurgie* 1985; 109:847-854.
22. Stoppa R, Rives JL, Warlaumont C *et al.* The use of Dacron in the repair of hernias of the groin. *Surg Clin North Am* 1984; 64(2):269-285.
23. Stoppa RE (en collaboration avec Houdard C). Le traitement chirurgical des hernies de l'aîne. Monographies de l'AFC, Masson et Cie Edit, Paris, 1984; vol. 1.
24. Vandamme JP. A preperitoneal approach in the prosthetic repair of inguinal hernia. *Int Surg* 1985; 70:223-226.
25. Warlaumont C. Les hernies de l'aîne. Place des prothèses en tulle de dacron dans leur traitement. (A propos de 1236 hernies opérées). Thèse Doct Méd, Amiens, 1982; p. 127.