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# Reduction of the scrotum by scrotomectomy and plasty in the surgical treatment of large hydroceles in lymphatic filariasis endemic countries

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**Keywords:** *Hydroceles, Resection-Plasty of the Scrotum, Scrotomectomy, Filariasis*

## ABSTRACT

**Objective:** to classify our techniques of reduction of the scrotum by resection or “scrotomectomy”, with plasty for large hydroceles.

**Patients/Method:** We developed three main types of scrotomectomy-plasty: unilateral, bilateral and resection of the inferior pole, utilized in a series of 50 scrotomectomy-plasty in a homogeneous series of 148 hydrocelectomy in 117 patients.

**Results:** 92% of patients treated by scrotomectomy-plasty had a hydrocele at an advanced stage (54% stage III and 38% stage IV). In 24% of preoperative indications for scrotomectomy-plasty we observed during surgery a sufficient retraction of the scrotum to prevent it. Thus, out of 117 patients 43% had a scrotomectomy-plasty. We recorded 6 complications, all in hydroceles stages III or IV with scrotomectomy-plasty. Five of these patients had a hematocele or chylocele. Two did not benefit from our compressive dressing. These complications only delayed by a few days the complete cure. In all cases the esthetic result was very satisfactory.

**Conclusion:** The esthetic and functional result of hydrocelectomy is significantly completed through resection-plasty of the scrotum without increasing the postoperative morbidity in the immediate and close follow up. The three main types of scrotomectomy-plasty that we developed and utilized allowed us to properly manage all stages from I to IV of our clinical classification. The technique should be extended to other homogeneous series for a more precise codification of the procedures as outlined and a review of patients on distant follow up.

## INTRODUCTION

The scrotum may not or may insufficiently retract during and/or shortly after the surgical treatment of a large tropical hydrocele. This finding in the Pacific, an area endemic for lymphatic filariasis, is only confirmed in the literature by Dandapat et al.<sup>1</sup>. In 1973 Wilkin-son<sup>2</sup> described a process of eversion of the hydrocele sac without resection of the excess scrotum counting on its “probable” contraction within three months after surgery, making an excision unnecessary. As Dandapat et al.<sup>1</sup> we observed very poor results in patients operated elsewhere by this technique, who consulted for an excessive postoperative scrotum causing -sometimes important- bodily disgrace and functional impairment.

In the extensive literature available on the surgery of hydroceles, the article published in 1984 by Dandapat et al.<sup>1</sup> is the only one, to our knowledge, explaining the reasons and reporting a technique of reduction of the scrotum in the surgical treatment of large hydroceles. However, we note that none of the reviewed articles published thereafter mentioned this technique. So it seems that the scrotal resection, in its

design and in its techniques, maybe insufficiently explained and illustrated, was not retained.

This work aims to codify the techniques of scrotal reduction that we developed during our long years of practice and practical usage. We recently documented the postoperative results of these techniques, in the immediate and short terms and in the medium term for some patients who were assessed after 13 months.

## METHODS

Two campaigns of hydrocelectomy, in 2009 and 2010 in four subdivisional hospitals completed by a third campaign (2011), in a district hospital in Fiji allowed the observation, the clinical classification and the surgical treatment of 117 patients with 148 hydroceles. We include under the term hydrocele, hematoceles and chyloceles treated by the same technique. The hydrocelectomy, unilateral or bilateral, was completed in 50 cases by a reduction of the scrotum by “scrotomectomy” and closure by plasty of our personal design. The clinical classification we developed and used is presented elsewhere<sup>3</sup>. It allows knowing exactly what type of hydrocele we are referring to when it comes to its size.

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We follow the World Health Organization guidelines<sup>4</sup> and treat all of them by total vaginectomy, whether simple or complicated by hematocele or chylocele. However, the standard technique leaves a “safety” collar of tunica vaginalis around the testicle. In our technique we go further, and systematically expand the standard vaginectomy to a complete resection of the parietal layer of the vaginalis by electrocautery knife, as close as possible to the path of its continuation as the visceral layer.

To this step, which we consider as a curative one, we associate in large or very large hydroceles but not systematically, a resection of the scrotum or “**scrotomectomy**” of the residual excessive scrotum with a plasty. We developed and use three main types of scrotomectomy-plasty: unilateral or bilateral plasty depending if they relate to one only or the two lateral portions of the scrotum and the resection of the lower polar cap (of the whole scrotum). The surgical technique of these resection-plasty is described in a separate detailed and illustrated article for surgeons.

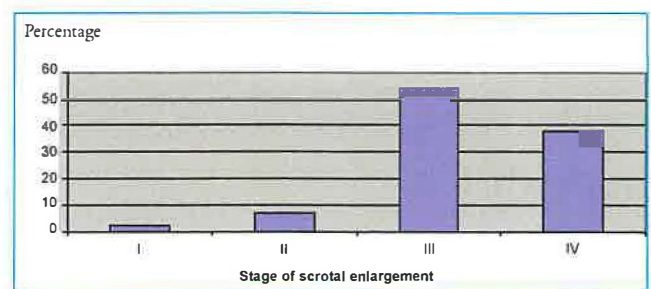
## RESULTS

The results presented here include only the 50 scrotomectomy-plasty we conducted between 2009 and 2011 in a homogeneous series of 148 hydrocelectomy, all realized in continuity and by the same team.

**Age distribution of patients:** The average age of these 50 patients was 46 years. The youngest was 24 years and the oldest 70. The majority of patients (81%) were between 31 and 60 years, with a peak of prevalence (35%) between 41 and 50 years.

**Type of scrotal resection-plasty used and hydroceles clinical characteristics:** Among the 50 patients in this series, 50% had a left side hydrocele. 12 hydroceles (24%) were bilateral. Figure 1 shows the distribution of plasty by clinical stage of the enlargement of the scrotum according to our classification<sup>3</sup>. 92% of patients who benefited from a scrotomectomy-plasty had a hydrocele at an advanced stage, respectively 54% at stage III and 38% stage IV. We made a resection-plasty, in addition to the hydrocelectomy, in one case of stage I and four cases of stage II of our classification.

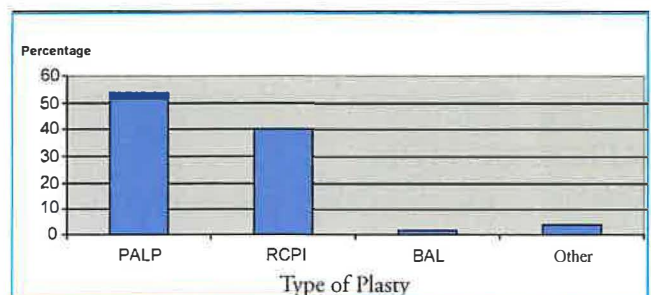
Figure 1 : Distribution of plasty by clinical stage of enlargement of the scrotum



### Distribution of type of plasty by technique used:

The distribution of scrotal reduction performed by type of plasty is shown in Figure 2. In 40% of cases we performed a Resection of the Lower Polar Cap (RCPI), and in 54% an Antero-Latero-Posterior Plasty (PALP). In 6% of cases we used a Bilateral Anterior-Lateral Plasty (BAL) or another type of plasty.

Figure 2 : Distribution by type of plasty



**Aspects of the liquid and hydrocele bag:** The fluid contained in the vaginalis is not always fluid and citrine. In this series of 50 hydrocelectomy with scrotomectomy-plasty, we note 3 chyloceles and 13 hematoceles (27%), with a thick and chocolate-colored liquid and without or with more or less abundant debris. The bag wall is usually thickened and inflammatory. In 4 cases it contained calcifications forming a difficult-to-dissect fibrous shell, requiring the emptying of the bag before opening and externalization of the intra scrotal mass. In these cases the resection of the vaginalis in one piece might be impossible even with the electrocautery knife, and might require its removal in several pieces.

**Preoperative indication of plasty and retraction of scrotum during and after surgery:** In our series of 117 patients we initially considered 66 cases (56%) for a resection-plasty of the scrotum. However, in 16 cases (24%) of preoperative indications, the retraction of the scrotum during surgery was sufficient to prevent the predicted resection-plasty of the scrotum.

Therefore 43% only of the patients – and not 56% as originally planned – finally benefited from a scrotomectomy-plasty.

So, while we do not deny the existence of per and/or postoperative scrotal retractions we also observe that the retraction of the scrotum is insufficient or inexistent in a high number of cases. Furthermore, among the 50 patients who had a scrotomectomy, no retraction of the scrotum during or immediately after surgery occurred. In any event, should a retraction occur, it would never be sufficient to adequately reduce the remaining excessive scrotum of a stage III or IV hydrocele. In fact, a postoperative retraction of the scrotum simply further improves the quality of the aesthetic result of the reduction of the scrotum by resection-plasty.

**Results of the technical procedure:** 111 out of the 117 patients who benefited from a hydrocelectomy (95%) had an uneventful postoperative course. Among the 50 patients who had a scrotomectomy-plasty in addition to the vaginectomy, 44 (88%) had remarkably simple postoperative course both locally and generally. They were discharged from hospital 4 to 6 days after surgery with the exception of a few patients who lived in remote and isolated places. As a reminder, these procedures were performed by a mobile team bringing its equipment in the different hospitals where a limited number of beds were allocated. There was therefore a need to shorten the stay for a quick turnover of patients. Results were excellent in all cases, both from the aesthetic and from the functional point of view. All patients reviewed after 13 months reported a positive psychological impact due to the full recovery of all their activities (walking, professional, sexual, sports, miction).

**Complications:** We observed six immediate complications. These 6 patients are aged 30 to 70 years. Five of them had a unilateral hydrocele with four on the right side. Only one had a bilateral hydrocele. Among these six complications we observed a hydrocele with no testis and one post-operative trauma after hospital discharge. These six cases had the following factors in common: - “large” or “very large” hydroceles: stage III or IV of our classification; - hydroceles associated with a buried penis of grade 1 (1 case), grade 2<sup>2</sup>, grade 3<sup>2</sup> or grade 4<sup>1</sup> of our classification; - hydroceles complicated with chylocele or hematocele with or without cruric debris;

- patients who had a resection-plasty of the scrotum: 4 PALP and 2 RCPI;

- strictly local complications, without hyperthermia: hematoma, infections, infected hematoma.

The overall complication rate in our series was 5% (117 patients): 12% for hydroceles associated with a plasty of the scrotum (50 patients), whereas it was 0% for hydroceles treated by total resection of the vaginalis and simple closure of the scrotum (67 patients). We also noted that among the 50 scrotomectomy-plasty, all but two patients benefited from our compressive suspensive dressing presented elsewhere (personal communication). These two patients were also among the 6 who had a complication. These six complications were treated by debridement and/or drainage and excision with drainage or wicking. In all cases the postoperative course was uneventful and the rapid and complete healing with a satisfactory esthetic result observed.

## DISCUSSION

The complete surgical treatment of large hydroceles with emptying and total removal of the vaginalis is required for all hydroceles in LF endemic countries, whatever their stage. “Standard” hydrocelectomy can effectively improve the anatomical aspect and the comfort of the patient. However the appearance and volume of the scrotum will often remain far from normal. The scrotum, stretched for years by a hydrocele which may contain a large amount of liquid (up to 3.6 liters in the series presented) does not always regain its elasticity. The muscle fibers of the dartos will equally not regain sufficient elasticity and contractility (often already weakened by age) to raise the intra-scrotal contents to its normal anatomical site: under the root of the penis.

Apart from the publication by Dandapat et al.<sup>1</sup> we did not find in the literature any description of surgical techniques for the reduction of the excessive scrotum or any reference to scrotal reduction interventions in the treatment of hydroceles. It seems that this problem has not received enough attention.

The techniques of extended scrotal resection proposed in the literature for peno-scrotal elephantiasis [5-11], are not suitable for hydrocele and, from our point of view, contra-indicated. They are not suitable because they are not justified in the treatment of hydrocele. These nearly complete resections of the scrotum are mutilating and the results of a surgery which is too heavy for a “simple” hydrocele.



The surgical act would be disproportionate. Some of them require skin grafts, hardly feasible in outpatient or semi-ambulatory surgery, with regular and prolonged monitoring and dressings required in strictly aseptic environment. This is not feasible in the implementation of concept of "hydrocele mass campaigns" (12, personal communication).

In contrast, the scrotum of a hydrocele, although often thickened, has kept sufficient flexibility and thinness to allow the realization of overlaying plasty, which are unrealizable or difficult to achieve in peno-scrotal lymphedema.

We present here a series of 50 unilateral or bilateral plasty. Even if we consider this number as insufficient to describe a clear classification of the indications, the encouraging results confirm our previous findings, and seem to allow consideration of the procedures presented. When the conditions allow it, the "scrotomectomy-plasty" significantly improves subjective and objective results. Subject to contra-indications and usual precautions, and given the results we think that indications can be expanded even at the cost of an increased risk of postoperative complications of 0% to 12% in our series. While these complications delay the final healing by a few days, they respond usually quickly to a simple treatment and do not affect the final result.

A scrotum distended by a hydrocele where the lower pole goes down to mid-thigh, or even lower, will not retract enough after hydrocelectomy to go back to its usual site, on the ventral side of the penis, with a lower edge of the glans at the same level as the lower pole of the scrotum. This consistent finding during our long practice, including twelve years in the Pacific, led us to conceptualize a preventive solution to the postoperative setbacks and disappointments of the surgical treatment of the urogenital complications of lymphatic filariasis in its most advanced forms. While postoperative complications (edema and hematoma) are reported with regularity, these setbacks on the esthetic result never appear in published series of hydrocelectomy, series which are often much larger than the one presented here.

The remaining surface of the scrotum is often large or very large after a simple closure of a large hydrocele, leaving in place a large "ear" of scrotum which may fall to mid-thigh. We therefore consider that in these cases, the surgical treatment did not fully reach its goal, in a surgery where the objective is also to reduce the excessive mass. To overcome this drawback, a "scrotomectomy-plasty" appears as the best solution.

The principle is to remove the maximum reasonable surface of distended scrotum and of dartos bag insufficiently retracted.

This is the only way to avoid leaving an unsightly residual pocket after removal of the hydrocele. This raises the problem of skin closure, especially after resection of the lower polar cap, removing the lower pole of the scrotum, also avoiding a suture on the lower pole of the future neo-scrotal purse(s) in anatomical position. Hydroceles shapes are as variable as their sizes. A hydrocele may develop transversely and not vertically. A right hydrocele may develop transversely to the left, pushing ahead the median raphe and the left testicle up or down, and vice versa. In these exceptional cases the classification that we proposed<sup>3</sup> should consider a vertical extension of the transverse dimension of the hydrocele.

Because of a big size right hydrocele, the lower pole of the right purse may have gone much lower down than the left side. It makes sense to bring it back up with an appropriate resection-plasty of the scrotum, even if it should be extended to the side not affected by a hydrocele<sup>3</sup>.

For uni- or bilateral hydroceles stages III and IV, a resection-plasty of the scrotum is necessary due to the considerable excess of the non-retracted scrotal envelope now emptied of its pathological content.

These preliminary observations led us to propose different types of flaps so as to cope with all possible situations. However, we always considered the following:

1) **The possibility of a peroperative retraction** of the scrotum especially, at least in principle, in the youth. This is why we never did the resection immediately. We first proceeded with the incision of the hydrocele, at the top or bottom limit of the future flap according to the type of resection-plasty considered. The contra-incision will be done, if necessary, after hydrocelectomy.

Due to the longer duration of the intervention, we may observe a sufficient retraction of the scrotum preventing the anticipated resection-plasty (drawn on the scrotum). Thus, out of the 117 patients, the anticipated scrotomectomy-plasty for 16 of them was canceled due to the sufficient spontaneous retraction of the scrotum. The age of these patients varied widely (41-61 years) as well as the stage of their hydroceles (stage II to IV, bilateral in two of them). Thus, the retraction of the scrotum during surgery is real and sufficient in about 24% of cases to avoid a scrotomectomy.

We observed no retraction of the scrotum immediately after or in the following days of the surgery.

In contrast, it seems interesting to report the observation of a 16 year old patient whose scheduled resection-plasty was canceled because of an excellent per-operative retraction. However he presented quickly after surgery an enlargement of the scrotum possibly by loosening. The indication of a second intervention for scrotal resection-plasty was therefore proposed and accepted.

**2) The need for the neo-purse to accommodate the testicle and its often long -or very long- and thickened cord:**

One need to keep in mind that the testicle cannot be compressed into a purse made too small because of a too generous resection. Thus, the case of this 67 year old patient, with a bilateral hydrocele, stage III on the right side and IV on the left, amenable to a resection of the lower polar cap. However, after drainage, the cord appeared thickened by inflammation as well as by distension, with an excessive length. This pleaded against the scrotomectomy which would have led to the bending of the cord for its reinstatement and a compression of the intra-scrotal contents in the neo-purses.

**3) The possibility of keloid scars.** This could be inconvenient or painful in some patients. While the resection-plasty leaves a longer scar, the proposed designs prevent any strangulation.

**4) Incision line:** as with any plastic surgery, **preliminary drawing of the incision is needed.** The incision line should be as winding as possible, without any acute angle.

**5) Path for surgical approach:** These resection-plasty **are only possible if the hydrocele is tackled from a horizontal path.**

**6) The advantages of the horizontal incision:** The front median vertical incision used by many operators, does not appear to us as suitable for the radical cure of hydrocele with total vaginectomy in LF endemic countries. We keep it for the idiopathic hydroceles, of much smaller size, especially in children with a flexible scrotum, a thin vaginalis, and easily externalized through a short incision. These small and idiopathic hydroceles are excluded from this work. The horizontal incision is preferred for the following reasons:

Filarial hydroceles are much larger (up to 2400 ml for a unilateral hydrocele in this series of 50 resection-plasty). The scrotum is an adult one, thickened, often inflammatory, sometimes with dermal lesions or scars (retractile after burns in one of our patients). Therefore

it does not lend itself to a sufficient spreading for in-depth dissection.

All the liquid can be accumulated at the lower pole of the hydrocele with the cord and testicle retracted to the upper pole. The initial approach of the cord in its highest part for its isolation as we consistently practice it is more difficult for large hydroceles through the usual incision.

As we reported above, the liquid is not always fluid and citrine. The surgeon can face a chylocele, or a hematocele with a thick chocolate liquid, combined with sometimes abundant cruoric debris or hematic "mud". In these cases a complete resection of the vaginalis (which cannot be maintained by simple flipping) is impossible or dangerous, and the cleaning, even prolonged, incomplete.

The bag wall is usually thickened and inflammatory. It may contain calcifications which can form a fibrous shell, difficult to dissect and first requiring the opening and drainage of the bag. Some authors have noted the presence of adult worms at the histological examination of the vaginalis [13-16]. We observed twice the presence of dead adults worms, maybe calcified considering their hard consistency. It appears to us illogical to leave in place a pathological tissue, moreover, often abundant (and heavy).

The vertical incision is inappropriate for scrotal reductions. From our point of view resection-plasty of the scrotum can only be performed by transversal resections in hydroceles stage III or IV.

A resection of the scrotum using an "orange quarter" shape, from one pole to the other after vertical incision can only lead to a decrease in volume in the width dimension of the purse. After hydrocelectomy, in case of absence or poor retraction of the scrotum, the residual scrotal enlargement is always downwards, whatever the form of hydrocele. Therefore one need to reduce but also to bring up the purses with a horizontal resection of the scrotum, even with a circular incision if needed (resection of the lower polar cap) and not with a vertical resection which can only lead to a reduction of the transversal diameter or the purse(s). A fortiori a resection of the lower polar cap of the purses can only be done through a circular horizontal incision.

For stage I or II hydrocele in which we can expect that a resection-plasty will not be needed, we use the transversal horizontal incision which can be enlarged secondarily in the anterolateral dimension, if needed. In stage III or IV hydrocele, where the need for a resection-plasty can be anticipated, the anterior incision must immediately be curved, convex or con



concave to allow enlargement according to the plasty envisioned. The type of plasty must indeed be pre-decided, even if it had to be adapted during surgery.

### **Drawbacks and limitations of resection-plasty of the scrotum.**

The resection-plasty of the scrotum increases the duration of the surgical procedure appreciably, especially in its expanded version covering both sides. The duration of the intervention is a limitation for mass campaigns of hydroceles (12, 17). A trained surgeon cannot expect to complete more than three hydrocelectomy by complete vaginectomy with complementary resection-plasty of the scrotum in a day.

The resection-plasty of the scrotum is not a simple operation. At the edge of the specialty, it requires a good knowledge and a good training in plastic surgery. This, especially considering that we are treating an often pathological and more retractile tegument than the skin.

The scrotectomy-plasty is not a standard technique, applicable to all hydroceles and the multiplicity of processes described may appear superfluous or a disadvantage. However, like their size, the shape of the hydroceles is extremely variable. Therefore it seems difficult, if not impossible, to make a classification based on their form, which would help to codify the different techniques of scrotectomy-plasty. This explains the large number and diversity of the proposed methods. Some techniques will be commonly used while others will be barely or unused. However, their knowledge may be useful to the surgeon to deal with all situations and scenarios, choosing a particular resection-plasty as a framework, allowing a reconstruction of the purse(s) as close as possible to normal anatomy.

The resection-plasty of the scrotum can be hemorrhagic. The bleeding cannot be prevented by the ligation of a cut vessel or vascular pedicle. Even though the bleeding is only venous and peripheral, it may be abundant. It is easy but long to control because spread over large areas of inflamed tissues. This bleeding cannot be anticipated. In our series of 50 resection-plasty, one patient required a postoperative blood transfusion; others were compelled to iron therapy.

Per-operative complications: bleeding apart (which, however, is far from constant) we cannot report any other complication. Experience, precision and attention are the guarantees of safety during a total (and not subtotal, leaving a collar of pathological tissue around the testicle) vaginectomy as we perform it.

It should be noted that due to the plasticity and the possible partial and irregular contraction of the scrotum during surgery, minor alterations are sometimes necessary. They are usually needed at the end of skin suture, particularly at the tips of the suture line to correct the "ears" and for the sake of perfection in the reconstruction of a spherical purse as perfect as possible (two cases).

Post-operative complications. The 6 complications observed occurred among the 50 patients who benefited from a resection-plasty of the scrotum. This corresponds to a 0% rate of complication for hydrocelectomy by total vaginectomy without scrotectomy and a 12% rate of complications among the 50 patients who benefited from a scrotal resection-plasty in addition to the hydrocelectomy by total vaginectomy. However, it is difficult to attribute these complications to the scrotectomy-plasty alone, considering the well-known frequency of this type of complications of hydrocelectomy in general and especially by vaginectomy, even subtotal as generally reported (18) but without a complementary scrotectomy-plasty. These 50 scrotectomy-plasty, with the exception of two patients, benefited from the compressive-suspensive dressing we proposed. We also observe that these two patients are part of the 6 patients with a complication.

We therefore believe it is prudent to complete any hydrocelectomy with or without resection-plasty, with the proposed compressive-suspensive dressing, which we consistently apply to all hydrocelectomies. We also note that these six complications all occurred in patients with hydrocele complicated by chylocele or hematocele. In these circumstances, it seems difficult to attribute these complications exclusively to the resection-plasty of excessive scrotum.

## CONCLUSION

The result of the “standard” hydrocelectomy in lymphatic filariasis endemic countries is often spectacular. However, in a number of cases, especially in hydroceles of stages III and IV of our classification, the result is not satisfactory both for esthetic reasons and because of the discomfort caused by the residual excessive scrotum. In our work an adequate per-operative retraction of the scrotum was observed in about one in four cases only. The preventive “scrotomectomy-plasty” that we developed was therefore needed in almost half of the hydroceles we had to treat in this series. The three main types of resection-plasty we developed and used allowed us to deal with all clinical cases presented to us, be they stage I, II, III or IV of our clinical classification.

We cannot present here long-term results, although the first 27 scrotomectomy-plasty were reviewed after 13 months with excellent results. However all cases are regularly monitored by local teams. We remain convinced, that our satisfactory results should be completed by additional series to confirm the validity of this approach and to attempt a more precise codification of the various techniques to select the most suitable type of scrotomectomy-plasty. A companion publication, intended for surgeons, exposes more technically the different approaches we use.

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