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Original Research Article

Shifting the Paradigm. Rutkow-Robbins Modified by Maldonado: Our Technique for Open Inguinal Hernia Repair, Outcomes and Review of the Literature

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Abstract: Approximately 20 million hernia surgeries are performed worldwide each year. The majority of groin hernia repairs are conducted electively and are regarded as low-risk procedures [1, 2]. In our Center, a developing country with government hospitals, laparoscopic available resources are sometimes insufficient to meet the demand for patients with inguinal hernias. As a result, open repair remains widely performed procedure. Based on this, we made a modification to the Rutkow-Robbins technique by applying its two fundamental physical principles—a plug and a mesh patch—reducing the prosthetic mesh used, and for the first time, shifting the paradigm regarding the effect of polypropylene mesh when in contact with the spermatic cord. This modification has shown favourable outcomes in a two-year follow-up. The aim of this paper is to describe our technique and present the outcomes achieved.

Keywords: Rutkow-Robbins, Inguinal, Hernia, Modified, Technique, Mesh.

INTRODUCTION

Many reports have highlighted the detrimental effects of polypropylene mesh coming into contact with the spermatic cord, including dysejaculation, sexual pain, orchialgia, and fertility issues [3]. As a result, it has been traditionally taught in open repair techniques that the mesh should always be placed above and never below the spermatic cord, however, think about laparoscopic repair—the mesh covers the entire intra-abdominal course of the vas deferens. This brings us back to the question of the learned paradigm: Does placing all the cord structures above the mesh truly prevent contact between them? Given that, the spermatic cord is a tubular structure, closing the anatomical planes inevitably forces close contact between them, thus, for all this time, we have been excessively concerned about an interaction that is, in reality, unavoidable. We decided to develop a simpler technique that is easier to replicate, eliminating the need for excessive manipulation of the spermatic cord—whether positioning it above or below the mesh during fixation—thereby reducing tissue edema.

Inguinal hernia is one of the most performed surgeries worldwide. The lifetime prevalence of IH is 27%–43% in men and 3%–6% in women [4]. Since 2019, following the publication of Dr. Gossetti's study [5] on intestinal complications associated with the use of cone-shaped or plug meshes, general surgeons have held the belief that using "cones" for inguinal hernia repair is obsolete, attributing to them high recurrence rates and intestinal complications, with some even labeling the technique as outdated. But, what has actually happened? Is the Lichtenstein technique truly the ideal option for open repair? Has laparoscopic repair become the preferred approach due to its lower recurrence rates? There is no absolute truth in medicine, much less in surgery. Cases of intestinal fistulas caused by mesh erosion affecting the small bowel have already been reported for both techniques [6, 7], recurrence has been observed in both as well [8, 9]. We must remember that the primary focus should be the patient -providing an effective solution to their illness- In our health system, we also take on the challenge of achieving optimal outcomes while minimizing resource used.

MATERIALS AND METHODS

We documented 134 patients diagnosed with inguinal hernia in 6 months, all of whom underwent surgery performed by the same principal surgeon, Dr. Paul Maldonado, and their surgical team, the follow-up was 2 years. We used the modified Rutkow-Robbins by Maldonado technique in all surgical interventions; in addition to demographic characteristics, we described perioperative variables, hernias were classified into three categories: direct, indirect, and mixed. We included complications such as postoperative pain (from the first postoperative day up to two weeks), subacute pain (more than two weeks to less than three months), chronic pain (more than three months), seroma, hematoma, surgical site infection, hernia recurrence, hospital readmission within 30 days, mesh-related intestinal fistula, fibroplasia in the vas deferens and mortality.

Surgical Technique

Preoperative marking was determined based on anatomical landmarks, specifically the anterior-superior iliac spine and the pubic symphysis. An imaginary line was drawn along the course of the inguinal ligament, and where the superficial or medial inguinal ring was palpated a marked skin incision of approximately 5–6 cm it is done (Figure 1).

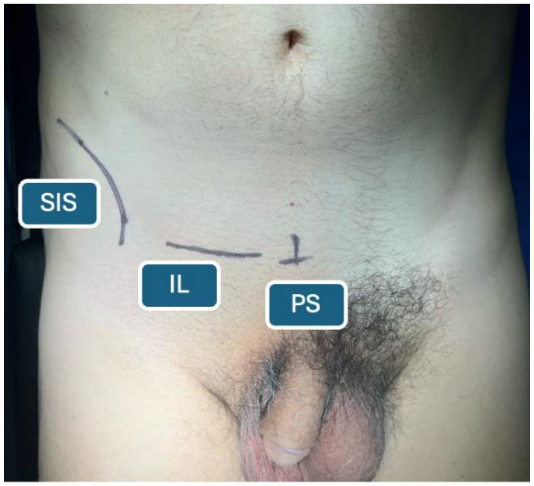

Figure 1: Left inguinal region. Marking of the anterior superior iliac spine (SIS), the pubic symphysis (PS), and an imaginary line crossing the inguinal ligament (IL)

Under epidural anesthesia, a proper aseptic and antiseptic technique is performed. An incision along the pre-marked area, followed by layer-by-layer dissection with meticulous hemostasis until reaching the external oblique aponeurosis. We incised the external oblique aponeurosis to expose the contents of the inguinal canal (Figure 2). As in any open inguinal hernia repair technique, the hernia sac was carefully separated from the structures of the spermatic cord. The hernia sac is then reduced into the preperitoneal and peritoneal space, along with the prehernial lipoma (Figure 3).

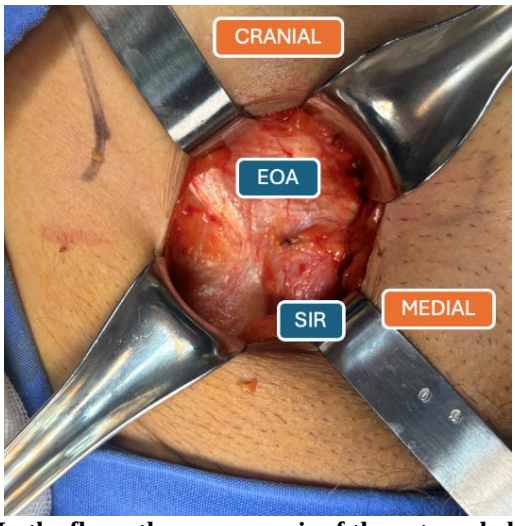

Figure 2: Left inguinal region. In the floor, the aponeurosis of the external oblique (EOA) is visible, with the superficial inguinal ring (SIR) protruding medially

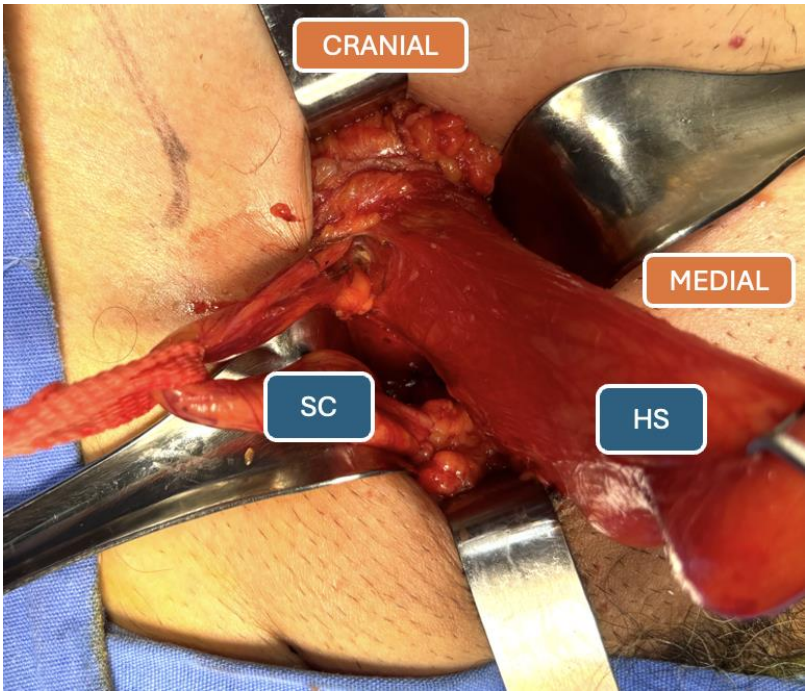

Figure 3: Left inguinal region. Once the spermatic cord (SC) has been dissected from the hernial sac (HS), it can be seen that the spermatic cord has sufficient connective tissue to protect the structures from contact with the mesh

At this stage, with the spermatic cord structures adequately dissected, the length of the mesh to be performed is measured, with an overlap of 1 cm medial to the pubic tubercle and 1 cm lateral to the deep or lateral inguinal ring (Figure 4). The fixation sites include the pubic tubercle, lacunar ligament, inguinal ligament, conjoint tendon, and the decussation zone of the musculoaponeurotic fibers forming the deep inguinal ring. All fixations are performed using separate single stitches with Polydioxanone-0 (Figure 5).

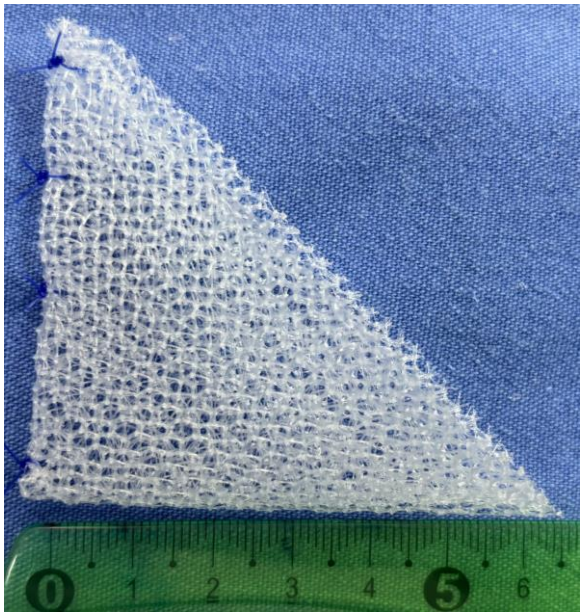

Figure 4: The final measurement of the mesh to be placed (measured in centimeters)

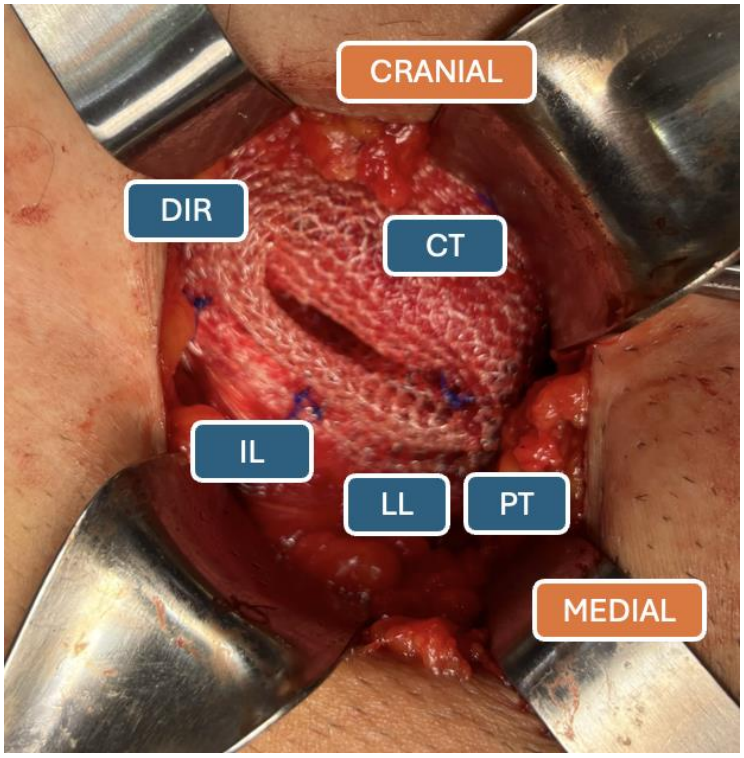

Figure 5: Left inguinal region. The fixation sites include the pubic tubercle (PT), lacunar ligament (LL), inguinal ligament (IL), conjoint tendon (CT), and the decussation zone of the musculoaponeurotic fibers forming the deep inguinal ring (DIR)

Our verification points included ensuring that the deep inguinal ring opening measured less than 1 cm; ascent and descent of the testicle and spermatic cord structures; confirming the last one, is positioned below the mesh in the border with the conjoint tendon. Before completing the procedure, three separate single mesh-to-mesh stitches are placed at the base of the preformed cone to prevent eversion of the hernia contents (Figure 6 and 7), effectively simulating a mesh patch. Finally, the patient was asked to perform a Valsalva maneuver to confirm the integrity of the inguinal repair. The wound is then closed in layers, and the procedure is completed (Figures 8).

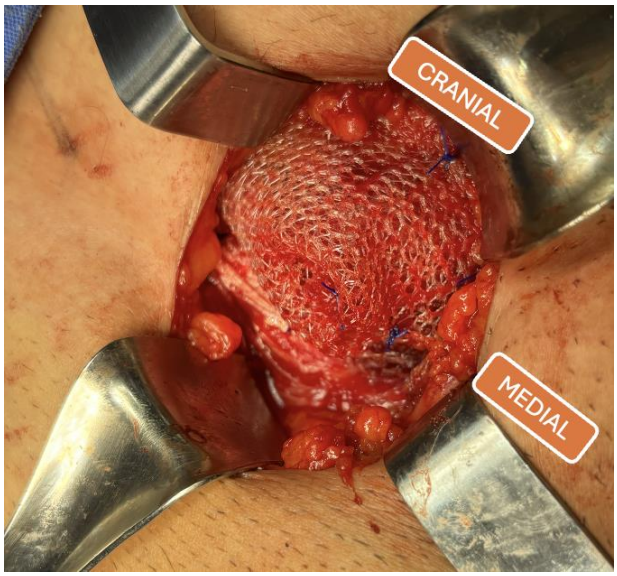

Figure 6: Left inguinal region. Tilted image to show how the mesh apex everts with the Valsalva maneuver

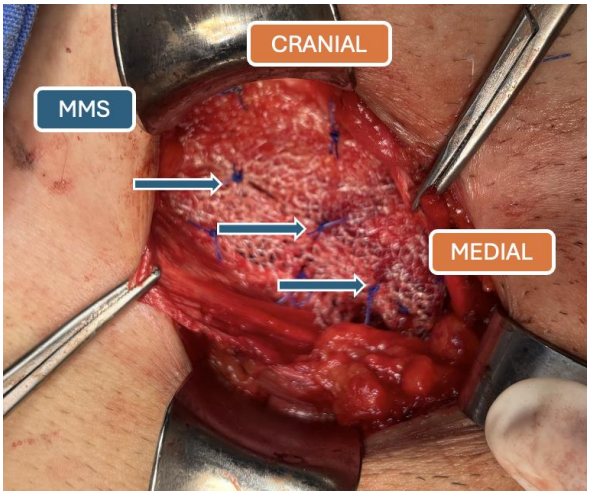

Figure 7: Left inguinal region. Image where we've already placed the mesh-mesh stitches (MMS) to prevent eversion and strengthen the floor of the inguinal region

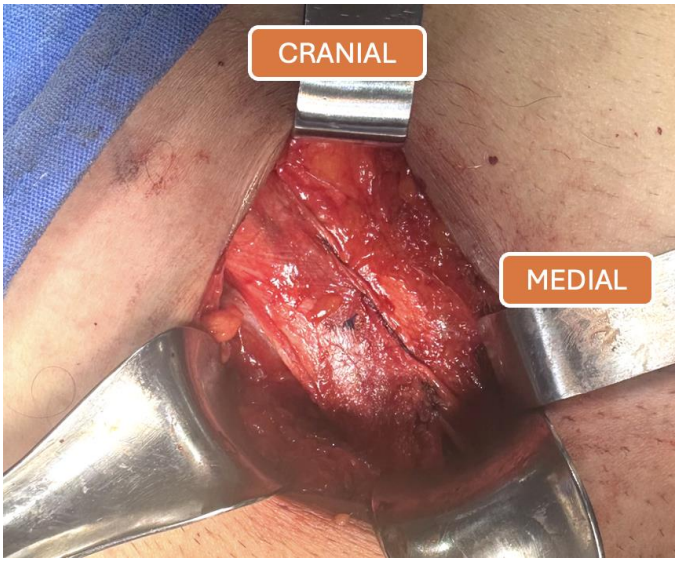

Figure 8: Left inguinal region. Image before facing subcutaneous tissue and skin, the closed external oblique fascia can be seen on the floor

RESULTS

We identified a similar distribution of hernia types to apply our technique and assess its applicability to all inguinal hernias. By the end of our study, the sample reached a third for each type of hernia, we did not adopt an existing classification system but instead divided them into three categories: 1) Direct hernias: Those in which the hernia sac protruded through Hesselbach's triangle; 2) Indirect hernias: Those in which the hernia sac followed the course of the inguinal canal along with its structures, with dilation of the deep inguinal ring; 3) Mixed hernias: Those in which the hernia sac was present in both anatomical locations (Table 1).

Table 1: Type of inguinal hernia

Type of Inguinal Hernia	
n=134	
	Frequency
Direct	43 (32.1%)
Indirect	45 (33.6%)
Mixed	46 (34.3%)

We decided to classify pain into three magnitudes, as previously explained. More than 70% of patients reported no pain at two weeks postoperatively. Approximately 25% of patients experienced persistent pain for more than two weeks, while a smaller percentage reported pain lasting up to three months. Fewer than 10% of patients still experienced pain at five months, but no patient reported pain beyond one year after surgery (Table 2).

Table 2: Classification of pain

Pain	
n=134	
	Frequency
PostOp	98 (73.1%)
SubAc	20 (14.9%)
Chro	16 (11.9%)
Pain at 5 months	12 (9%)
Pain at 10 months	0 (0%)

Postop: postoperative pain (from the first postoperative day up to two weeks); SubAc: subacute pain (more than two weeks to less than three months), Chro: chronic pain (more than three months)

We categorized surgical site complications into two groups: patients who experienced no postoperative events and those who had "mild" complications. Severe complications are discussed separately. The 30% of patients had no surgical site complications, while the remaining 70% experienced some form of postoperative events. Seroma was the most common finding, occurring in more than 50% of patients, these were drained, with an approximate fluid volume of 8–12 ml. Nearly 15% of patients developed a hematoma at the surgical site, and 2.2% of patients had a surgical site infection. Importantly, none of these patients required hospital readmission or prosthetic material removal (Table 3).

Table 3: Surgical site complicactions

Surgical site complications	
n=134	
	Frequency
No-SSC	40 (29.8%)
SSC	94 (70.1%)
Seroma	72 (53.7%)
Hematoma	19 (14.1%)
SSI	3 (2.2%)

No-SSC: none surgical site complications, SSI: surgical site infection.

Only 1 patient returned due to hernia recurrence, which for this study meant 0.7%. We attribute this event to the fact that at least the patient had been operated on twice, the first with a tension technique, and once more with the Lichtenstein technique. We were able to remove almost all the previous mesh but at some fixation points it coincided with our new previous mesh. None of the operated patients required hospital readmission within 30 days, nor was fibroplasia in the vas deferens suspected or documented, and no mortality associated with this protocol was observed (Table 4).

Table 4: Sever complications

Severe complications n=134	Frequency
Hernia recurrence	1 (0.7%)
HR within 30 days	0 (0%)
M-RIF	0 (0%)
FVD	0 (0%)
Mortality	0 (0%)

HR: hospital readmission, M-RIF: mesh-related intestinal fistula, FVD: fibroplasia in the vas deferens

DISCUSSION

The open technique for inguinal hernia repair remains highly prevalent in our country, particularly in government hospitals. Traditionally, for the past ten years, the Lichtenstein technique has been considered the gold standard, as it meets the criteria established by international hernia associations for an ideal surgical technique—being simple, easily reproducible, and feasible even for less experienced surgeons [9, 10].

Changes occur in the peritoneum's elasticity when in contact with the mesh, leading to its stiffening and the formation of a new barrier at the site of the abdominal wall defect [11, 12]. In 1993, Drs. Alan W. Robbins and Ira M. Rutkow introduced their technique to reinforce the dilated inguinal ring by placing a cone-shaped mesh plug while also strengthening the inguinal floor with a mesh patch. Their study demonstrated the success of this approach, reporting over 1,500 cases of both primary and recurrent hernias, with a 0.2% recurrence rate over a 2.4-year follow-up period [13].

However, over time, many surgical training programs discontinued this technique, primarily due to the use of a "cone," attributing to it potential complications such as mesh-related enterocutaneous fistulas.

In our general surgical practice, we sought to simplify the Rutkow-Robbins technique by designing a cone-shaped mesh with a wide base and short length. The objective was to allow the prosthetic material to induce fibroplasia in both the inguinal floor and the deep inguinal ring simultaneously. When we extend the mesh over the inguinal region, the cone apex tends to retract and shorten, barely reaching the preperitoneal fat in Bogros' space. Furthermore, we apply mesh-to-mesh sutures for two primary reasons: 1) to prevent the abdominal contents from everting and 2) to avoid excessive deepening of the mesh apex.

We have observed favorable outcomes in our patients. Over the past two years, the only documented case of hernia recurrence was associated with a patient who had undergone two previous surgical repairs. At five months postoperatively, 90% of patients reported no procedure-related pain, and by ten months, 100% were pain-free. Notably, nearly 30% of our patients experienced some degree of peripheral paresthesia around the incision site at the two-year follow-up, which aligns with expectations in the literature, even when compared to the gold standard [14].

To date, we have taken meticulous care to avoid excessive skeletonization of the spermatic cord structures, ensuring the presence of a tissue barrier that protects against fibroplasia, mimicking peritoneal closure when placing a mesh in the preperitoneal plane. With at least two years of follow-up using our technique, we have not observed complications related to fibroplastic infiltration of the spermatic cord structures.

CONCLUSIONS

We consider that our modification of the Rutkow-Robbins technique is a simple, reproducible, and easy-to-learn and teach procedure. It requires less prosthetic material and reduces the likelihood of meshoma [15]. We confirmed that the traditional belief that the spermatic cord must be placed above the mesh rather than below does not increase the risk of mesh infiltration complications. Instead, excessive skeletonization of the structures is the primary contributing factor [3]. Our findings demonstrate that Dr. Maldonado modification is a valuable option for open inguinal hernia repair. Contrary to traditional concerns, it does not increase the risk of intestinal fistula, dysejaculation or sexual pain, as has historically been attributed to the use of "cones" and the positioning of the mesh in inguinal defect repairs.

However, further studies and additional cases replicating our technique will be necessary to strengthen the evidence.

Conflicts of Interest: The author declares no competing financial interests and nothing to disclose.

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