

Research Article

The Socio-Economic aspects of Laparoscopic Approach in the Treatment of Inguinal Hernia by Mesh in Cameroon

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Abstract

Background: In Sub-Saharan Africa (SSA), economic conditions often do not always permit the use of

modern surgical techniques, especially for hernia treatment.

Aim of the study: To demonstrate that a modern technique such as Laparoscopic Total Extraperitoneal inguinal hernioplasty (TEP) can be performed at a significantly lower cost thanks to the use of a less expensive mesh material.

Settings: The study was performed in Douala at the Gynaecology-Obstetric and Paediatric University Hospital and at governmental Regional Hospitals of Ayos and Edéa in Cameroon.

Material and methods: Prospective, randomised, double-blind, controlled trial (RCT) including consecutive adult patients presenting with primary inguinal hernia treated by TEP, with implantation of either sterilised mosquito net mesh (MNM) or conventional polypropylene mesh (CPM).

Results: 62 patients were enrolled; randomization allocated 32 to MNM and 30 to CPM. Both groups were comparable for age and professional activities. Significant perioperative differences pertained to conversion rate (2/32 MNM), due to external (electrical power) factors and mesh removal for early obstruction (1/30 CPM). Hospital stay was less than 2 days in both groups. All patients resumed their activities after 3 weeks. Costs were significantly lower in the MNM group. No recurrences were noted with a follow-up of median 21(12-30) months.

Conclusion: This RCT shows that TEP with MNM is feasible, cost-effective with good outcomes in SSA hospital setting.

Keywords: Total extra peritoneal; Mosquito net mesh; Conventional polypropylene mesh; Socioeconomic aspect; Inguinal hernia

1. Introduction

Inguinal hernias represent an often-underestimated public health problem. This condition is widespread in Africa and concerns all social stratas [1,2]. It affects the active population, with adverse socio-economic consequences. Its treatment is surgical and aimed at being both effective and affordable to a large majority of patients [3,4]. The use of open herniorrhaphy remains the standard of care in most Sub-Saharan African (SSA) countries, due to its affordability and the possibility of being performed under local anaesthesia [5,6]. The standard treatment for hernias is prosthetic hernioplasty [7]. However, prosthesis' cost and risk of infection are two major barriers to standard prosthetic hernia treatment in SSA. Use of sterilized mosquito net mesh (MNM) as an alternative prosthesis is increasingly considered as a valid treatment option for hernias in countries with limited resources [8]. This innovative approach permits the use of modern techniques in countries without universal health coverage, where most patients are cash payers These alternative prostheses are increasingly used in many African countries with the spread of Lichtenstein's technique [8,9,10]. With the advent of laparoscopy in Africa, we aimed at evaluating the use of MNM in laparoscopic hernia repair, in terms of clinical and economic outcomes, particularly in underserved rural areas.

2. Material and Methods

From October 2018 to March 2020, 62 patients, including 48 men, were enrolled. The sex ratio was 3.4; the average age was 48.5 (16-77) years. Participants suffered from a unilateral or bilateral inguinal hernia, primary in 47 patients (76%), or recurrent in 15 patients (24%). Patients were

randomized consecutively in 2 groups and operated in 2 healthcare centres, namely the district hospitals of Ayos (Centre region of Cameroon) and Edéa (Littoral region of Cameroon).

Patients in group 1 received a sterilized nylon MNM, and those in group 2 received a conventional polyethylene parietene® (Medtronic, Dublin, Ireland) macroporous mesh (CPM) prosthesis. The laparoscopic technique under general anaesthesia was the Total extraperitoneal laparoscopic route (TEP). We evaluated the following aspects:

Socio-demographic (Table 1); clinical (Table 2); in-hospital stay (Table 3) and cost of procedures (Table 4). Detailed protocol of the present study has been published elsewhere Manuscript BJS-2264-Jul-20, in press. We carried all interventions within a

humanitarian framework.

3. Results

The demographic and socio-economic details of the study participants are shown in table 1. The sixty-two patients had a monthly income ranging from 15 to 450 €. A total of 75 hernias were operated. Group 1 (n=32) included 40 hernias (53.33%), including 16 bilateral (21.33%) in 8 patients and 24 unilateral (32%) in 24 patients. Forty MNMs were placed in 32 patients (16 bilaterally and 24 unilaterally) and 35 CPMs in 30 (10 bilaterally and 25 unilaterally). The TEP technique made it possible to diagnose 3 (4%) previously unrecognized hernias (table 2) Hernia distribution was as follows: 33 indirect hernias (44%); 25 direct hernias (33.33%); 8 crural hernias (10.7%) and 8 mixed hernias (12%).

Variables	Total number N=62	Percentage (%)
Gender		
Male	48	77.40
Female	14	22.60
Age range		
15-30	12	19.40
30-45	9	14.50
45-55	16	25.80
55-77	25	40.30
Profession		
Loader	2	3.20
Sportive	1	1.60
Student	1	1.60
Housewife	5	8.10
Teacher	3	4.83
Agriculture	45	72.60
Worker	4	6.45
Unemployed	1	1.61
Place of residence		
Urban	26	41.90
Rural	36	58.10

Level of education		
Not in school	2	3.20
Primary	15	24.20
Secondary	39	62.90
Superior	6	9.70
Monthly income		
0- 50 000Fcfa	40	64.51
50 001 - 200 000Fcfa	19	30.60
200 001 - 300 000Fcfa	2	3.20
300 000 - 400 000Fcfa	1	1.60

Table 1: Socio-demographic characteristics

Characteristics of groin hernia	Total Numbers (n)	Percentage (%)
Clinical Anatomical data		
Inguinal lateral hernia	N=54	
Inguinal hernia left	21	38.18
Inguinal hernia right	23	41.81
Bilateral inguinal hernia	10	20.01
Lateral crural hernia	N=8	
Hernia crural left	5	62.50
Hernia crural right	3	37.50
Bilateral crural hernia	0	0
Pre-operative Anatomical data		
Lateral inguinal hernia	N=54	
Inguinal hernia left	20	37.03
Inguinal hernia right	22	40.74
Bilateral inguinal hernia	12	22.22
Lateral crural hernia	N=08	
Hernia crural left	5	62.50
Hernia crural right	2	25.00
Bilateral crural hernia	1	12.50
Anatomical type	N=75	
Indirect inguinal hernia	33	44
Direct inguinal hernia	25	33.33
Mixed inguinal hernia	8	10.66
Hernia crural	9	12.00
Contra-lateral herniation discovered intra-operatively	N=03	
Inguinal hernia	2	66

Crural hernia	1	33.33
Type of hernia according to occurrence	N=62	
Primary hernia	51	82.30
Recurrent hernia	11	17.70

Table 2: Topography and operative anatomical data

In Group 1 complications included 2 conversions (2.6%), 1 seroma (1.3%), and 2 haematomas (2.6%). In Group 2, 2 seromas (2.7%), 1 haematoma (1.3%), and 1 internal hernia on the peritoneal breach (1.3%) occurred. Neither prosthesis infection nor wall infection occurred in either group. 61 patients (98.4%)

were discharged on the 1st post-operative day and 1 patient (1.6%) on the 2nd post-operative day (table 3). Return to professional activities took place between 7 and 21 days after surgery. No infectious complications or recurrences were observed after 21 months.

Associated factors	Conventional prostheses (n%)	Mosquito net prostheses n (%)	Total n(%)	OR (IC 95%)	P-value
Duration of hospitalization					
1 days	30 (49.2)	31 (50.8)	61 (98.4)	-	0.520
[2-3] days	0 (0)	1 (100)	1 (1.6)	0 (0-20.27)	0.520
Resumption of activities					
[7-14] days	1 (50)	1 (50)	2 (3.2)	1.07 (0.03-42.97)	0.740
[14-21] days	7 (70)	3 (30)	10 (16.1)	2.94 (0.68-15.11)	0.130
> 21 days	22 (44)	28 (56)	50 (80.6)	0.39 (0.09-1.5)	0.140

Table 3: Distribution hospital stay and return to work according to the type of prosthesis used

The purchase cost of a 10x15 cm MNM was 0.00078 euros (€), and the combined cost of MNM purchase + sterilisation was <1 €, whereas a 15x15 cm CPM

prosthesis was locally purchased at 67 €. Full economic outcomes are displayed in table 4.

	Open procedure (For memory)	Laparoscopy	Humanitarian Mission
Intervention under GA	R: 150.000 Fcfa	R: NA	Offered
	PM: 150.000 Fcfa	PM: 150.000 Fcfa	
	PC: 150.000 Fcfa	PC: 150.000 Fcfa	
Hospital stay	1000F/d X4d: 4000 Fcfa	R: NA	Offered
		MNM: 2000 Fcfa	
		CPM: 2000 Fcfa	

Prosthesis	R: 0 Fcfa	R: NA		Offered
	MNM: 650 Fcfa	MNM: 650 Fcfa		
	CPM: 44.000 Fcfa	CPM: 44.000 Fcfa		
Fixed price coelio		R: NA		30.000 Fcfa
	0 Fcfa	MNM: 30000 Fcfa (humanitarian)		
		CPM: 30000 Fcfa (humanitarian)		
Medicines with fixed price	d0-d1: 10.000 Fcfa	R: NA		Offered
	>d1: 5000 Fcfa/d	MNM: 10.000 Fcfa (d0-d1)		
	4d: 25.000Fcfa.	CPM: 10.000 Fcfa (d0-d1)		
TIW	R: 30d	R: NA		
	MNM: 30d	MNM: 15d		
	CPM: 30d	CPM: 15d		
Total		With fixed price coelio	Without fixed price coelio	30.000FCFA
	R: 179000 Fcfa	R: NA		
	MNM: 179650 Fcfa		R: NA	
	CPM: 223000 Fcfa	MNM: 192650Fcfa		
	+ TIW 30d		PM: 162650Fcfa	
		CPM: 236000Fcfa		
			CPM: 206000Fcfa	
		+TIW 15d		
			TIW: 15d	

Table 4: Costs of interventions
R: Herniorrhaphy (Without prosthesis);

NA: Not Assessable; TIW: Temporary Incapacity to Work, GA: General aesthesia; d: days

5. Discussion

5.1 Social and demographic aspects

Our survey revealed a high incidence of surgically treated hernia among an active population living in rural areas where the study took place. Ninety-five percentage of patients had surgery in the district capitals of Ayos and Edéa, which are small towns where the active population essentially lives from subsistence farming and small trade. Most participants in this study were men. Our findings were in line with previous observations of male predominance among African patients with inguinal hernias [11,12]. In our study, the participants’ mean age was 48.5 years, a

figure in accordance with the observation that among Africans primary inguinal hernias tend to occur mostly in relatively young patients [13]. Almost three-quarters (72.6%) of patients in the current study were farmers, whose physical activities of daily living expose them to intraabdominal and/or wall pressures that can lead to hernia. Our findings are consistent with previous observations by Rouet et al. 2017, in Cameroon [10], where farmers represented 70% of their study population.

5.2 Clinical aspects

We listed 75 hernias among 62 patients. Unilateral

hernia represented 79% of all cases (40.3% left and 38.7% right) and bilateral hernia 21%. Half of these inguinal hernias were indirect, 37.8% were direct, and 14.5% were mixed. These findings are in line with previous observations from other series reporting the preponderance of indirect hernias [14-17]. In addition, during surgery we found three undiagnosed hernias, ie. 2 inguinal hernias and 1 femoral hernia. These findings are comparable to previous observations from other series, reporting the discovery of preoperatively undiagnosed hernias [18,19]. While the majority of cases were primary hernias, 17.7% of them were recurrences, a figure comparable to the 17.1% rate previously reported in Cameroon by Rouet et al. [10]. Potential predisposing factors might be heavy physical work and previous surgical techniques used, essentially mesh free herniorrhaphy [16].

5.3 Therapeutic aspects

Hernia treatment took place in hospital under general anaesthesia (GA), locoregional anaesthesia (LRA), or local anaesthesia (LA). In LMICs, open herniorrhaphy is usually performed under LA or LRA without prosthetic implant with an average postoperative inactivity of 1 month and a high recurrence rate [16]. However, treatment with prostheses is not prevalent because of costs and infection risks. In SSA countries patients usually come to hospital when the hernia is already highly-symptomatic or disabling [17]. This survey shows that prosthesis treatment, recognized as a reference in terms of effectiveness and post-operative comfort, can be carried out safely in rural areas without associated morbidity. Prosthetic hernioplasty can be performed by open route as well as by laparoscopy. The laparoscopic approach allows for simultaneous diagnosis and treatment of hitherto unrecognized contralateral hernias. Moreover, it has

the advantage of being less invasive. In our series, 3 hernias were diagnosed and treated this way. Besides, TEP permits prophylaxis of crural or obturator hernias, since these anatomical areas are covered by the prosthesis surface. TEP is also ideally suited for treating recurrent hernias. All recurrences in our series were easily-treated by TEP. The hospital stay was 1 day for almost all (98.4%) patients.

5.4 Economic aspects

Agriculture is the primary occupation in SSA rural areas. In our study, 72.6% of patients were farmers. Effective treatment such as hernioplasty with prostheses would limit recurrences and have several advantages, including substantial economic benefits in this population, especially when laparoscopy is used [18,19]. Considering the local pricing at Edéa's hospital (see table 4), we observed that a simple mesh free herniorrhaphy under general anaesthesia (GA) by an open approach costs 179.000 Fcfa (275 €), a sum that includes surgery, hospital stay and medicines. The estimated cost of prosthetic hernioplasty with a MNM prosthesis by open approach amounted to a comparable sum, i.e. 179.650 Fcfa (276 €) (cost of MNM prosthesis: 650 Fcfa (1 €)), versus 223.000 Fcfa (343 €) with a CPM prosthesis (cost of CPM prosthesis: 44.000 Fcfa(67 €)).

Conversely, inguinal hernia repair by laparoscopy costs 192.650 Fca (about 296 €) with MNM prosthesis and 236.000 Fca (about 363 € with A CPM prosthesis, including surgical act, hospital stay and medicines and a humanitarian contribution (30.000 Fcfa; about 45 €) to cover the cost of laparoscopy. Without the humanitarian contribution to the hospital's costs these amounts would be reduced to 162.650 Fcfa(250€) with a MNM prosthesis, and to 206.000 Fcfa(317€) with a CPM prosthesis. Consequently, a laparoscopic-based

approach would be even less expensive than open surgery (250€ versus 276€) provided MNM is used, because of reduced use of medicines and shorter hospital stay. In a context where the monthly income of patients in rural areas averages a mere 30.000 Fcfa, and where no universal health insurance covers for hospital expenses, loss of revenue due to professional inactivity is of the utmost importance. Laparoscopic inguinal hernia repair offers many advantages, including reduced prosthesis cost with sterilized MNM, early resumption of professional activities, and shorter hospital stay. In the current study, 98.4% of patients returned home on the first postoperative day, with only limited and temporary reductions in

6. Conclusion

This study shows that prosthetic hernioplasty is a feasible and affordable treatment for inguinal hernias in SSA. It can be performed by open and laparoscopic approach without additional morbidity. Sterilized mosquito net mesh prosthesis is a safe and inexpensive alternative to commercial prosthetics. In economic terms, laparoscopic MNM permits the early rehabilitation and rapid resumption of professional, social and familial activities.

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professional, social, and familial activities. In fact, that modern surgical (laparoscopic) interventions cost up to 4 to 5-times more than open approach is mostly a result of the surgeon's bill for his/her operation. Sadly, patients often opt for less efficient solutions because they are more affordable. Consequently, Cameroonian state support seems indispensable to guarantee that most vulnerable populations would have access to the most efficient cures. We therefore recommend capping the surgeon's fees for this type of intervention, and ideally establishing adequate social security coverage for the treatment of these pathologies. Further large-scale studies are needed to confirm our observations.

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