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STANDARD GROIN DISSECTION VERSUS "RIVER FLOW" INCISION TECHNIQUE - A COMPARATIVE COST ANALYSIS AT AN INDIAN TERTIARY CARE CANCER INSTITUTE

Surgery

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ABSTRACT

BACKGROUND: Groin dissection has been a nightmare for even most of the experienced surgeons due to its high morbidity. To overcome this, various incision techniques have been described in the literature. Despite this, morbidity rates range between 30-52%. By our modified "River Flow" groin dissection incision technique, we have reduced all procedure related morbidities significantly. We calculated the savings of the government institution from our self-designed technique.

RESULTS: In 208 cases, no peri-operative mortality and not even single flap necrosis occurred with the river-flow incision. Seroma formation was the most common complication observed in 13.9% of cases. Skin edge necrosis was observed in 5.29% cases and wound infection in 6.7% cases. All the complications were managed conservatively. While comparing the two techniques, we found that there is a significant per patient cost difference in our river flow incision technique and various other incision (mainly lazy S-shaped) techniques. The postoperative stay of the patients was also significantly less with our technique and therefore almost Rs 1,10,72,200 ($146795.2) had been saved for the institution and government.

CONCLUSION: Our technique is more cost-effective than standard technique due to a reduction in the postoperative morbidity.

KEYWORDS

Groin dissection, Ilio-inguinal dissection, cost-analysis

BACKGROUND:

Groin dissection is one of the commonly performed surgeries for various malignancies in both the genders – for carcinoma penis (in males), carcinoma vulva (in females), carcinoma anal canal (post chemoradiation in case of inguinal nodal recurrence or residual disease), few sarcomas and skin tumors including malignant melanoma and squamous cell carcinoma arising in the lower limbs [1]. The major complications of this procedure include wound infection, skin flap necrosis, seroma, edema, and secondary hemorrhage [2, 3]. Various types of incisions that have been described to prevent these complications are lazy S incision, T incision, horizontal incision, Gibson's incision, skin bridge incision, etc [4]. But all these incisions almost always had inconsistent outcomes with wound infection and groin flap necrosis rate as high as 23% [5]. This leads to an increased rate of re-do surgeries in the form of debridement and/or flap coverage, thereby, causing longer hospital stay and excessive financial burden on the health care system. A 'river flow' incision technique earlier published by us had reported a lower rate of complications without compromising oncological outcomes [6,7]. This study intends to calculate the total cost incurred by the government hospital and the comparative cost analysis while using the standard groin dissection technique and our "river flow" incision technique.

METHODS:

The study was conducted at the Department of Surgical Oncology of a high volume tertiary care cancer center. All patients who underwent inguinal and ilioinguinal lymph node dissection were admitted and discharged between July 1, 2012, and June 30, 2019. The total cost inclusive of disposables, consumables, laboratory, radiological investigations along with administrative costs, etc. were calculated and entered in a data master sheet. Routine preoperative investigations such as hemogram, renal function tests, liver function tests, electrocardiogram, and chest X-ray were done in all patients. The total cost was calculated by doing costing under various cost elements.

Calculation of Cost:

The cost incurred by the hospital was calculated based on the premises established by the Tata Consultancy Services study [8]. The average costing is considered more appropriate and practical for any services in the hospital management system. The data collection for the services should be gathered at the level of the cost center itself. The cost of service is added to the expenditure at the time of consumption of material by the cost center.

Determinants Of Total Cost:

The total cost of any product/ service is determined by three main elements:

a) Material
b) Labor
c) Expenses.

Material:

All consumable and disposable items constitute the material. This includes all the medicines, intravenous fluids, hospital diet, and others (e.g. thermometers) that are used for providing health care to the patient.

Labor:

Labor cost was calculated from the total salary (including allowances) of consultants, residents, nurses, technicians, and Group D employees of the hospital. Data regarding the salaries was obtained from the accounts section of the hospital and was apportioned as per the study done by the Tata Consultancy Services [8].

Expenses:

These include all the direct and indirect expenditure incurred on ancillary services like electricity, water, and air conditioning plant. The net cost incurred by the hospital per bed per day was calculated as below:

Cost to hospital per bed per day = Total per day cost for the whole hospital/total number of beds in the hospital.

As per the Cost and Accountancy guidelines and standard practice, all over the world; the total cost of any service cannot be ascertained without incorporation of the indirect cost. The indirect costs cover expenses on furniture, building, and equipment. Not taking into account these indirect costs makes the expenditure calculation falsely low. The burden of indirect costs is also borne by the hospital administration and includes the expenditure on running ancillary departments like laboratory medicine, radiodiagnosis, and blood bank. The other support services like pantry services, CSSD (central sterile supply department), medical record department, and laundry and sanitation department also add to the indirect costs which are considerable and cannot be neglected.

The other domain of indirect cost includes expenses on construction and maintenance of buildings. The furniture and equipment cost must also be taken into account along with the depreciation @ 10% per annum while assuming that the total life of such equipment/furniture is 10 years. The detail of furniture and equipment used in the ward was gathered from the sister in charge of the ward. The data obtained from

the central store was used to calculate the total cost per bed.

Total cost per day = (cost of equipment/10)/365.

Total cost per bed per day = total cost per day/total number of beds in the ward.

Similarly, the cost of building and maintenance as ascertained by the CPWD (Central Public Works Department) was used to calculate the total cost per bed.

Results:

This study was conducted in the Department of Surgical Oncology of our hospital from July 2012 to December 2019. During this study period, 208 groin dissections were conducted in 116 patients. Bilateral groin dissection was performed in 92 patients and unilateral dissection was done in 24 patients. (Table-1)

Table-1: Disease-wise Distribution Of Patients

S No	Malignancy	No of Patients
1	Carcinoma penis	53
2	Ca Vulva	26
3	Ca Ano-rectum (Post CTRT)	07
4	Inguinal metastasis of unknown origin	09
5	Peri urethral carcinoma	03
6	Melanoma Lower limb	09
7	Ca Cervix	04
8	STS lower limb	03
9	SCC lower limb	02
Total patients		116

The overall outcome of all groin dissections showed no postoperative mortality. None of the patients had complete flap necrosis. Seroma formation was the most common complication, observed in 29 cases (13.9%), skin edge necrosis in 11 cases (5.29%), and surgical wound infection in 14 cases (6.7%). During the routine follow-up, nine patients (4.3%) had persistent seroma, six patients (2.8%) had grade II lymphedema and three patients (1.44 %) developed DVT. Overall, thirteen patients (6.2%) had recurrence which included 7 Patients (3.3%) with recurrence at the local site while systemic recurrence was observed in 6 patients (2.8 %). [Table -2] All patients were managed on an outpatient basis. The median lymph nodes harvested were 10 on both the sites (interquartile range [IQR] 7-15). The median operative time was 80 min (IQR 60-90) and blood loss was minimal 25 ml (IQR 20-35 ml). No femoral artery blow-out was observed in any patient even after receiving radiotherapy. The mean hospital stay of these patients was 4 days with a range of 3-9 days.

Table-2: Complications Of Groin Dissection

Complication	Number of patients (% of total)
Seroma	29 (13.9%)
Skin edge necrosis	11 (5.29%)
Surgical wound infection	14 (6.7%)
Persistent seroma	9 (4.3%)
Grade II lymphedema	6 (2.8%)
DVT	3 (1.44%)
Local recurrence	7 (3.3%)
Systemic recurrence	6 (2.8%)
Complete flap necrosis	0
Post-operative mortality	0

As per the Tata Consultancy Services report, faculty and senior residents devote 67% and junior residents devote 50% of their time towards patient care. The rest of their time is spent on teaching and research work. Therefore, the salary of faculty and residents was apportioned accordingly. Whereas, the nursing staff and class C and D employees are involved in only patient care. Therefore, for the final calculation, their whole salary was apportioned towards patient care. Based on the capital and other costs, the total cost of staying in the general ward was Rs. 4,150.06 ($55) /bed/day. Out of which, the maximum amount Rs. 2,830.34 ($37.5) (68.2%) was incurred in providing manpower only. Rs. 726.01 ($9.62) was spent in material supplies while the remaining was spent in building maintenance and support services (indirect costs).

The total expenditure on the patients (n=116) of groin dissections was Rs 19,25,628 ($25530). The average cost borne by the hospital was Rs 16,600 ($220) per patient with the maximum being Rs 37,350 ($495) and a minimum of Rs. 12,450 ($165). A usual hospital stay of patients with the most popular incision i.e. “S”-shaped incision ranges from 16 to 44 days (mean 30.4 days) [9]. Other described incisions like vertical incision (3-41 days, mean 15 days), elliptical incision with > 4 cms skin ellipse (6-14 days, mean 9 days), and elliptical incision with minimal skin excision ((8-28 days, mean 16 days) also have a significantly higher hospital stay than that of our river flow incision technique [10-11]. So in such a scenario, the cost of hospital stay ranges from a maximum of Rs 1,66,000 ($2200) to a minimum of Rs 66,400 ($880). Rs 1, 12,050 ($1485.6) is the cost per patient to the hospital with the above-mentioned incisions and techniques. [Table-3]

Table-3: Calculation Of Cost Per Patient

A) Total cost/bed/day (A)	Rs 4150.06 ($55)
B) Total expenditure per patient with River flow incision technique (Cost/bed/day x Mean hospital stay i.e. 4 days (A x 4)	Rs 16600 ($220)
C) Total expenditure per patient with other incisions - mean hospital stay = 27 days (A x 27)	Rs 112050 ($1485)
D) Net savings per patient with river flow incision technique (C-B)	Rs 95450 ($1265)
E) Total savings of the institution (D X 116)	Rs 11072200 ($146795)

Hence, there is a huge per patient cost difference with our river flow incision technique i.e. Rs 16,600 ($220) versus Rs 1,12,050 ($1485.6) with various other incisions and operative techniques. The postoperative stay of the patients was significantly less with our river flow incision technique and therefore almost Rs 1,10,72,200 ($146795) had been saved for the institution and the government.

DISCUSSION:

Groin dissection is considered as a part of the standard-of-care surgical treatment for urogenital and anorectal carcinomas, skin tumors, and few sarcomas. It was first described in 1912 by Basset [12]. Over the years, many modifications were suggested about the incisions and techniques for groin dissection. (2, 4, 13) The rate of common complications of standard groin dissection techniques (wound infection, wound dehiscence, seroma, skin flap necrosis, lymphedema, and deep vein thrombosis) varies considerably across the studies [3, 13-15].

We earlier described our technique for ilioinguinal lymph node dissection [6] based on the modification of the skin bridge technique earlier reported by Fraley et al [16]. Our technique entails two curvilinear incisions: an inguinal incision, approximately 7 cms in length, 4 cm below and parallel to the inguinal ligament; and an iliac incision, of approximately 5-7 cm length, 4 cm above and parallel to the inguinal ligament. Our initial experience with this technique showed positive outcomes in terms of a very low complication rate and optimal oncological outcomes. There are three main advantages of our technique: (a) Due to the lower medial curve, it spares the saphenofemoral junction from where the supplying vessels emerge and the curve broadens the skin flap, thereby improving the circulation, (b) It defines the standard boundary of dissection precisely, (c) The curve reaches the lower and upper limits of dissection without requiring much traction on the flap edge, thereby reducing the chances of necrosis [6, 7]. We wished to do a cost analysis of this technique along with a head-to-head comparison with standard techniques in monetary terms. This study is important to understand the impact of new techniques in considerably reducing the financial burden on the health care system. To the best of our knowledge, there is no published literature on cost analysis in groin dissection techniques to date.

India belongs to a group of low and middle-income countries (LMIC). The majority of the population belongs to the rural areas and is below the poverty line. The onus of providing optimal health care (including oncological care) predominantly lies in the government sector rather than the private sector. The public health care across India is already compromised in terms of financial support. Therefore, it becomes crucial for hospitals to adopt pocket-friendly treatment programs without jeopardizing the health of the patient. Still, the patient has to spend out of his pocket for a part or whole of the hospital expenditure. There is no existing regular cost accounting in any hospital in India [17].

The total cost incurred by the hospital in providing in-patient cancer

care to patients undergoing groin dissection was Rs 4150.06/bed/day. The mean postoperative stay with our river flow incision technique was 4 days whereas it ranged from 16-40 days with other incisions. This led to considerable financial savings amounting to Rs 1,10,72,200 ($146795). The labor cost was adjudged as per the standard Cost and Accountancy Guidelines. It was calculated by apportioning the salary of the entire staff spectrum involved in-patient care, to the extent of their time commitment in the same study setting. (8)

The reason behind this significant monetary gains with our technique points to the lower morbidity of the procedure and therefore, much needed, shorter hospital stay. The huge economic impact due to change in surgical technique (incision) as seen in our study calls for more such studies. The physicians and surgeons in the low and middle income countries should focus on developing such low-cost treatment programs and innovations to ease the financial burden on the healthcare system.

There are certain limitations to our study. We admit that our study did not include expenses incurred during surgery. The personal losses to the patient arising out of disability and longer hospital stay were not taken into account. We also did not include transportation expenses of the patient due to multiple visits to the hospital for follow up visits and management of wound complications, dressings, etc.

CONCLUSION:

The authors conclude that our innovative River-flow incision technique for groin dissection allows for cost-cutting in the resource-constrained settings with improved surgical outcomes without compromising oncological outcomes for various malignancies.

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