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ORIGINAL ARTICLE

Frequency of CSF Leak after Primary Repair of Incidental Durotomy in Lumbar Spine Surgery with use of Fibrin Glue

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ABSTRACT

Aim: To find the frequency of CSF leakage after primary repair of incidental durotomy in lumbar spine surgery with use of fibrin glue.
Study Design: Descriptive case series.
Place and duration of study: Neurosurgery Unit 2, Punjab Institute of Neurosciences, Lahore General Hospital, Lahore from 25-02-2021 to 25-08-2021.
Methodology: Sixty five patients admitted for lumbar spine surgery and informed written consent was taken. All the cases were operated in elective operation theatre. Valsalva maneuver was performed per-operatively in all patients to assess CSF leakage. In all patients having incidental durotomy diagnosed per-operatively, primary repair with Prolene 4-0 was done and sealed with fribrin glue. Patients were examined on daily basis for CSF leakage. In case of no complication, patient was discharged on day 07 after surgery. In case of CSF leakage on clinical examination, MRI spine was done. After discharge, patient was followed in OPD on weekly basis for 30 days. CSF leak was done as per operational definition.
Results: Total of 65 patients, 41(63.1%) were in age group of 16-40 years and 187(36.9%) were in age group of 41-75 years and mean age was calculated as 38.93±11.47 years. There were 44(67.7%) were male whereas 21(32.2%) were females. Frequency of CSF leakage was 9(13.8%) after primary repair of incidental durotomy in lumbar spine surgery with use of fibrin glue.
Practical Implication: We found that frequency of CSF leakage was 13.8% after primary repair of incidental durotomy in lumbar spine surgery with use of fibrin glue. The rate of CSF leakage is low. Therefore, we concluded that fibrin glue is useful for the treatment of incidental durotomy in lumber spine surgery.
Conclusion: This study showed that the CSF leakage was 13.8%. As the rate of CSF leakage is low. Therefore, we concluded that fibrin glue is useful for the treatment of incidental durotomy in lumbar spine surgery.
Keywords: Cerebrospinal Fluid Leak, Incidental Durotomy, Lumbar Spine Surgery.

INTRODUCTION

Lumbar spine surgeries impart a major burden on neurosurgical centers around the world. The most common indications for lumbar spine surgeries include traumatic injuries to spine, prolapsed intervertebral disc, caries spine, metastatic spine disease, spinal stenosis, degenerative spondylolis thesis and congenital and developmental anomalies[1]. The most common lumbar spine surgeries being performed are laminectomy, discectomy, decompression with fusion and fixation, and minimal invasive surgeries[2]. The most common complications of lumbar spine surgery are wound infection, neurological deficits, need for revision surgery and incidental durotomy; all leading to morbidity, prolonged hospital stay, increased cost, delayed return to normal routine life style and even mortality. Incidental durotomy is one of the most common complications of lumbar spinal surgeries.[3] Risk factors for incidental durotomy including older age, female sex, experience level of the surgeon, increased surgical invasiveness, revision surgery, degenerative spondylolisthesis, hypertrophied ligaments and synovial cysts. Incidental durotomy may lead to CSF leakage causing secondary complications such as nausea, vertigo, postural headache, infection, wound dehiscence, durocutaneous fistula, meningitis even intracranial hemorrhage[4-6].

Most of the cases of incidental durotomy are identified intra-operatively as leakage and collection of a clear fluid. Valsalva maneuver may help in identifying the presence and pattern of tear. If the tear is missed during surgery, it may be diagnosed post-operatively based on symptoms and signs, and with the use of MRI spine. The pattern of durotomy varies from punctate opening to a laceration. Whenever it is diagnosed intra operatively, primary repair of tear is advocated. Repair options include primary repair with non-absorbable sutures, whenever possible. It might be further augmented with muscle or fat flap, heterologous dural implants and use of sealant fibrin glue[7]. The primary closure is not feasible, a combination of sealant and graft can be used. Various sealants are applied to ensure a watertight closure in both intended and unintended durotomy[9].

Two studies conducted in Pakistan show the incidence of incidental durotomy in lumbar spine surgeries to be 4.3% 5 and 8.92%[6]. Adam et al reported an incidence of 8.69% of CSF fistula after incidental durotomy.4Kinaci et al reported that the frequency of CSF leakage after use of fibrin glue is 9.1%[9]. Medical resources, diagnosis, and treatment must improve in developing countries. There are limited resources: access to medical and health resources; knowledge about disease; awareness, trainings, and awareness about health[15-22].

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MATERIALS AND METHODS

After confirmation of diagnosis with detailed history, physical examination and CT scan spine or MRI spine, all the patients admitted for lumbar spine surgery. Informed written consent for participating in this study was taken. All the cases were operated in elective operation theatre. Valsalva maneuver was performed per-operatively in all patients to assess CSF leakage. In all patients having incidental durotomy diagnosed per-operatively, primary repair with prolene 4-0 was done and sealed with fribrin glue. Patients were examined on daily basis for CSF leakage. In case of no complication, patient was discharged on day 07 after surgery. In case of CSF leakage on clinical examination, MRI spine was done. After discharge, patient was followed in OPD on weekly basis for 30 days. CSF leak was done as per operational definition.

RESULTS

Total of 65 patients fulfilling inclusion and exclusion criteria were selected to assess frequency of CSF leakage after primary repair of incidental durotomy in lumbar spine surgery with use of fibrin glue. Age distribution of the patients was done, it showed that out

of 65 patients, 41(63.1%) were in age group of 16-40 years and 187(36.9%) were in age group of 41-75years and mean age was calculated as 38.93±11.47 years (Table 1). Gender distribution of the patients was done, it showed that 44(67.7%) were male whereas 21(32.2%) were females (Table 2). Frequency of CSF leakage was 9(13.8%) after primary repair of incidental durotomy in lumbar spine surgery with use of fibrin glue (Table 4). Stratification for postoperative CSF leakage with respect to age using and post op CSF leakage with respect to hypertension (Table 5-6).

Table 1: Distribution of age (n= 65)

Age (yrs)	No.	%
16-40	41	63.1
41-75	24	36.9
Total	65	100.0

Mean±SD =38.93±11.47 years

Table 2: Distribution of gender (n=65)

Gender	No.	%
Male	44	67.7
Female	21	32.3

Table 3: Distribution of hospital stay (n= 65)

	Mean±SD
Length of hospital stay (days)	7.69±1.50

Table 4: Distribution of CSF leakage (n= 65)

	No.	%
Yes	9	13.8
No	56	86.2

Table 5: Stratification for postoperative CSF leakage with respect to age using chi-square test

Age group		Post Op CSF leakage		Total
		Yes	No	
16-40	Count	3	38	41
	% of total	4.6%	58.5%	63.1%
41-75	Count	6	18	24
	% of total	9.2%	27.7%	39,9%
Total	Count	9	56	65
	% of total	13.8%	86.2%	100%

P value 0.046

Table 6: Stratification for post op CSF leakage with respect to hypertension using chi-square test

Hypertension		Post Op CSF leakage		Total
		Yes	No	
Yes	Count	0	25	25
	% of total	0	38.5%	38.5%
No	Count	9	31	40
	% of total	13.8%	47.7%	61.5%
Total	Count	9	56	65
	% of total	13.8%	86.2%	100%

P value 0.011

DISCUSSION

Cerebrospinal fluid (CSF) leakage is a pervasive complication of spine surgery, after intradural surgery or unintended durotomy in extradural surgery. Persistent leakage of CSF can lead to secondary com-plications such as postural headache, durocutaneous fistula, meningitis and even intracranial hemorrhage. Unintended durotomy occurs in 1-2% of all extradural cases, with higher rates in patient under-going revision surgery and in elderly patients. Despite repair, 10% of these patient's experience CSF leakage. This rate is even higher in redo surgery. With more than one million spine procedures performed in the United States each year, more than10,000 patients are annually at risk for CSF leakage[6]. The incidence of symptomatic CSF leakage for intradural surgery is 5%-13%, which is comparable to that for unintended durotomy. Longer admissions and various interventions result in increased healthcare costs of nearly 50%[9].

In current study, we found that age distribution of the patients was done, it showed that out of 65 patients, 41(63.1%) were in age group of 16-40 years and 187(36.9%) were in age group of 41-75 years and mean age was calculated as 38.93±11.47 years. Gender distribution of the patients was done, it showed that 44(67.7%) were male whereas 21(32.2%) were females. In this study, frequency of CSF leakage was 9(13.8%) after primary repair of incidental durotomy in lumbar spine surgery with use of fibrin glue. Another study found that the incidence of incidental durotomy in lumbar spine surgeries has been reported to range from 0.1-13%[3].

Two studies conducted in Pakistan show the incidence of incidental durotomy in lumbar spine surgeries to be 4.3%[5] and 8.92%[6]. Kyinaci et al reported that the frequency of CSF leakage after use of fibrin glue is 9.1%[9]. Surgical complications may be divided into major and minor categories. Major complications are those which require return to the operating room, prolonged inpatient or outpatient care or irreversible pathology directly related to surgery (neural injury, pulmonary emboli and symptomatic nonunion). Minor complications on other hand do not require prolonged inpatient or outpatient care (for example a dural tear, transient radiculopathy)[10].

It is important to recognize that perioperative complications are not a significant predictor of long term clinical outcome. Unintended durotomy, wound infection and thromboembolism were identified as common complications associated with spine surgery. Variety of risk factors for these complications have been identified by many authors. Patient's age, obesity, diabetes, urinary incontinence, tobacco intake, poor nutritional status, complete neurologic deficit, revision surgery, use of non-steroidal ant-inflammatory drugs (NSAIDs), posterior surgical approach, increased estimated blood loss, need for blood transfusion, prolonged surgical time, multilevel surgery, fusion extended to the sacrum and use of spinal instrumentation have all been correlated to an increased risk of complications in adult spinal surgery[11,12].

A CSF leak also predisposes the patient to poor wound healing and possible wound dehiscence. Immediate, intraoperative recognition of ID and dural closure may avoid these circumstances if the dural repair is successful and the patient does not continue to experience CSF leakage past the dural barrier. However, the optimal method of intraoperative dural repair remains unproven. Fibrin glue, a human or bovine-derived gelatinous matrix combining fibrinogen and thrombin, remains the most frequently used adjuncts to dural repair in the United States. There has been extensive literature, both in vitro as well as in vivo, regarding the use of fibrin glue at multiple sites in the body to augment or primarily close tissue defects. Although the augmentation of dural closure with these products is commonplace, the treatment with fibrin glue increases both the cost and the risk to the patient[13].

The most important aspect of treating CSF leak is prevention, including preoperative risk factor evaluation and intraoperative meticulous manipulation. Residual bone spikes may puncture the dural sac. Instrumentation may lead to more dead space and para spinal muscles tamponade is essential to effectively prevent small dural tear. In some cases, a dural tear will not rupture the arachnoid membrane and CSF leak will not occur. But because of the thin, delicate nature of the arachnoid, any procedure that increases intra-abdominal pressure, such as violent awakening from anesthesia, coughing, constipation and urinary retention, would induce dural tear. For revision surgery, it is recommended to begin dissection in areas of unscarred tissue and proceed toward the potentially scarred regions[14].

CONCLUSION

In current study, we assessed frequency of CSF leakage after primary repair of incidental durotomy in lumbar spine surgery with use of fibrin glue. We found that the frequency of CSF leakage was 13.8% after primary repair of incidental durotomy in lumbar spine surgery with use of fibrin glue. The rate of CSF leakage is low.

Therefore, we concluded that fibrin glue is useful for the treatment of incidental durotomy in lumber spine surgery.

Conflict of interest: Nil

Ethical consideration: This study was approved by hospital ethical committee.

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