

A prospective Study of Dural Tears among 430 cases of Lumbar Spine Surgery

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Abstract

Inadvertent Dural tear (DT) is a possible feared complication of spinal surgery. This is a prospective study of 430 consecutive patients with different types of lumbar spinal surgery within the period of 'January 2010 to December 2018'. Aim of the study is to evaluate incidence of dural tear (DT) with risk factors, compare between DT and non DT group with outcome. Incidence of dural tear were more on patients with older age, degenerative spinal stenosis, spondylolisthesis, re-operative surgery, multiple level surgery and with instrumentation. No significance sex difference found. Postoperative complications were more and outcome poor in DT group in comparison to non DT group. Every spine surgeon should be aware of possible dural tear and must know how to deal it.

Keywords: Dural Tear (DT); DT group; Non DT group.

Introduction

The number and complexity of spinal procedure is increasing in the last decades leading to a greater prevalence of Dural Tears (DT) which may cause severe consequences. Their incidence varies among different authors (1-17%) [1]. In a nationwide database analysis of 2009 in The USA by Hiroyuki Yoshiro and Daisuke Yonevka revealed incidence of DT was 2.7% (17932/665818). Older age, female gender, increased comorbidity and high hospital case load were significant risk factor for DT. Comparison between patients with or without DT showed that those with DT had significantly higher overall inpatient complications (18.8 vs 10.2%), higher in hospital mortality rate (0.4 vs 0.3%), longer hospital stay, lower proportion discharged home routinely (61 vs 76%) and increased total hospital charges respectively [2]. When dural injury

occurs, in the majority of cases it is detected intraoperative and primary repair is mandatory with the established surgical technique. Unfortunately not all dural tears can be recognized and repaired adequately primarily. Even with experienced surgeon inadvertent pinhole type durotomies may go unrecognized during surgery. With the present investigation the authors aim to evaluate the incidence of Dural Tears (DT) during different types of decompressive and reconstructive surgical procedure in lumbar region, also indicating the most common reasons for durotomies, treatment and early and remote outcome.

Materials and Methods

This is a prospective study of 430 consecutive patients with different types of decompressive and reconstructive procedure in the lumbar region within the period of 'January 2010 to December'

2018. We excluded from the study patients treated for tumor, trauma, infection and deformity.

Basic demographic information including age, sex, body mass index (BMI), history of previous lumbar spine surgery were compared between patients who had intra operative dural tear and patients who do not have a dural tear. We also recorded the length of surgery (minutes), estimated blood loss during surgery (ml) and amount of drainage (ml) and compared the data between the two groups. In all cases in which an incidental durotomy had occurred one of the surgeon filled up a questionnaire that included data regarding tear. The data that were obtained included following : when the tear occurred during the procedure (exposure, decompression or instrumentation), what instrument was in use when the tear happened, whether attending or resident/fellow caused the

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Indication for surgery (Lumber region)	Total no	Gender		Age	Dural Tear	Incidence (%)
		Male	Female	M/F	M/F	M/F
Disc protrusion	62	44	18	38.4/37.2	4/0	9.09/0
Disc extrusion	110	70	40	39.7/37.6	1/3	1.4/7.5
Disc herniation	142	82	60	35.4/33.2	1/2	1.2/3.3
Degenerative spinal stenosis	75	36	39	62.4/ 58.2	5/3	13.8/7.6
Spondylolisthesis	18	10	8	45.2/39.2	2/2	20/25
Reoperative surgery	23	14	9	42.2/40.2	3/2	21.4/22.2
Total number	430	256	174	41.57/40.86	16/12	6.25/6.89

tear and presence/absence of patient reported headache on postoperative day 1. For each case exact location of tear was documented. The Wiltse system for reporting the size and location of lesions in the spine was implemented. If DT occurred the closure was achieved by application of running suture over the localized dural defect together with autologous fat graft sutured over the defect and was reinforced with gelatin spongiosten. The postoperative results among the patients with or without DT were evaluated on the 1st, 3rd, 12th and 24th week after interventions. VAS (Visual analogue scale) and ODI (Oswestry Disability Index) Scales were used for the evaluation of all Patients. The statistical significance was evaluated using Chi-squared test with value of $p=0.05$.

Results

This is a prospective study of 430 consecutive patients with different types of decompressive and reconstructive procedure in the lumber region within the period of 'January 2010 to December' 2018. Overall incidence of dural tear is 6.51%. Here obviously degenerative spinal stenosis, spondylolisthesis and re operative surgery posed higher percentage of incidence of dural tear. Primary spine surgery (n=407) has less risk of developing dural tear than Re operative surgery (n=23), p-value <0.01 which is very significant. There is no significant difference in sex distribution of patient for dural tear. ($P > 0.05$). Mean age of DT group: 47.25 years. Mean age of Non DT group: 40.99 years. Statistical analysis denote p-value < 0.01 when compared between ≤ 50 years age group and > 50 years group in occurring dural

tear during spinal surgery which is very significant. P-value for instrumented and no instrumented group for occurring Dural tear <.001 which is highly significant. P-value for single level and multiple level (more than one level) for occurring dural tear <0.05 which is significant.

P-value when considered between 1-2 level versus ≥ 3 level surgery group for causing Dural tear is <0.001 is highly significant.

Discussion

Dural tears (DT) is one of the frequent complications of spinal surgery and despite effective treatment modalities it is generally feared by Surgeons due to its possible serious consequences [3]. In our study overall incidence of dural tear is 6.51% which is higher than incidence of DT in study of Hiroyuki et al. [2]. Previous studies showed a significant difference in incidence of dural tears [4,5], usually with a lower incidence in retrospective studies [6]. Wang et al., in a review of 641 consecutive patients who undergone lumber surgery found a 14% incidence in dural tear [7]. Sin et al. [6] prospectively studied 76 patients to determine risk factors for dural tears in a cohort patients with degenerative spinal conditions. Two factors were statistically significant: experience of the surgeon (more tears were caused by a resident in training) and patient age. However their study did not support the argument that it is more common to cause tear in revision surgery than in primary spine surgery. Our study also shows a higher incidence of dural tear in older patients (p-value<0.01 in comparison between ≤ 50 years age group and > 50 years age group). This is due to degenerative changes occurring throughout aging process, such as narrowing of spinal canal and thickening of ligamentum flavum. DT group had more mean duration of symptom before surgery than non DT group in our study.

We do not support the notion that less

Age group	No. of patients (%)	DT group (%)	Non DT group (%)
<20	15 (3.4)	0 (0)	15 (100)
21-30	83 (19.3)	3 (3.6)	80 (96.4)
31-40	122 (28.3)	5 (4.1)	117 (95.9)
41-50	88 (20.4)	6 (6.8)	82 (93.2)
51-60	75 (17.4)	8 (10.6)	67 (89.4)
61-70	38 (8.8)	4 (10.5)	34 (89.5)
71-80	9 (2.09)	2 (22.2)	7 (77.8)
Total	430	28 (6.51)	402 (93.49)

Number of level	Patients			Dural Tears		
	Total	Instrumented	Non Instrumented	Total	Instrumented	Non instrumented
1	226	18	208	9	6	3
2	172	25	147	9	5	4
≥3	32	32	0	10	10	0
	430	75	355	28	21	7

	DT group (n=28)	Non DT group (n=402)
Mean duration of symptom (months)	14.2	13.2
Mean time of surgery (minutes)	92	65
Postoperative complications	12	30
Mean VAS score improvement (at 12 weeks)	5.2	7
ODI score improvement (at 12 weeks)	48.6	70.2

experienced surgeons tear the dura more frequently. In some part of the surgery one can predict difficulty in performing decompression due to adhesion or dense scar above the dura. These part of the surgery are more likely to perform by attending more experienced surgeon. Out of 28 DT cases 6 were caused by less experienced surgeon in doing 90 procedure. In some study as Albayrak et al. [3] there is significant risk among female sex to have dural tear. In our study there is no significant difference in sex distribution of patient for dural tear. Unlike Sin et al. [6] and similar to many other previous study [8,9] we found that revision surgery is a risk factor for dural tear ($p < 0.01$). This is probably due to loss of anatomical landmarks and adhesion which are more common in revision cases. In our study degenerative spinal stenosis and spondylolisthesis cases also have higher rate of dural tear. Based on our data and reference we strongly recommend for the surgeon to be aware of the higher incidence for durotomy while conducting revision surgery and to be more cautious around the area covered with dense scar tissue. Our study demonstrate a higher incidence of durotomy in patients with instrumentation than patients with decompression alone ($p < 0.001$). In a

study Yossi et al., did not found a difference in incidence of dural tear between patients who underwent decompression alone and patients who had decompression and instrumented fusion [4]. Some study show higher incidence of DT in instrumentation [8,9]. We also found higher incidence of dural tears in patients with multiple level of surgery ($p < 0.001$ when considered ≥ 3 level surgery). Higher incidence of dural tear in patients with instrumentation and multiple level surgery can be due to complex pathology of these cases requiring surgery and instrumentation and/or can be due to the procedures which are more complicated in these cases. In our study DT group required higher average operation time than non DT group corresponding to many studies. Along with other feature in DT group repairing dural tear require some time contributing to higher operation time. In a study Proietti L et al. [10], showed complications in 16.2 % cases (complications in 55 patients out of 338 patients) in lumbar spine surgery as neurological deficit, deep vein thrombosis, pulmonary embolism, accidental durotomy, misplaced screw with radiculopathy, urinary tract infection, superficial and deep wound infection, hematoma.

In our study post-operative complications were encountered in 42 patients (9.76%). But in DT cases post-operative complications were higher (complications in 12 cases in 28 patients with dural tear, 42.88% p -value < 0.001). From our study we conclude that post-operative complications are likely to occur in DT group.

In addition to complications associated with spine surgery expected complications of dural tear include CSF leakage and this can lead to pseudomeningocele, dura-cutaneous fistula, meningitis, arachnoiditis, epidural abscess, intracranial subdural hematoma, nerve root entrapment, wound healing complications, persistent headache or reoperation for leakage repair [3]. In DT group we encountered superficial wound infection (5 cases), discitis (3 cases), misplaced screw with radiculopathy (2 cases), UTI (1 case) and CSF leakage with dura-cutaneous fistula (1 case). All these cases were treated conservatively. Except one case of CSF leakage other complications are not directly due to dural tear. We could not conclude that whether these complications are attributed with dural tear or attributed with complexity of these cases and procedure performed. Mean improvement in VAS score and ODI score at 12 weeks follow up are higher in non DT group. DT group have a poorer prognosis than non DT group which along with other factors can be due to dural tear and its consequence.

Limitations of the study

This is a single center study with small sample size, which may not reflect the scenarios of the whole country.

Conclusion

Every spine surgeon must be aware of possible occurrence of dural tear especially in high risk group and must know how to deal with this complications of spine surgery to avoid possible poor outcome of patients.

References

1. SK Kalevski, NA Peev, MD and DG Haritonova. *Incidental Dural Tears in Lumbar Decompressive Surgery: incidence,causes, treatment, results.* Asian JNeurosurg. 2010 jan-jun: 5(1) : 54-59,PMCID :PMC 3198662.
2. Hiroyuki Yoshira and Daisuke Yonevka.*Incidental Dural Tears in spine surgery: analysis of a nationwide data base.* Eur Spine J. 2014Feb; 23(2): 389-394.published online 2013 Nov9. PMID: PMC 3906460.
3. SerdalAlbayrak ,SaetOzturk, Omer Ayden and NecatiUcler. *Dural Tear: A Feared Complication of Lumbar Discectomy.* JTNEPUB_14065_online.pdf.
4. Yossi Smorgick, MD, Kevin C Baker PhD, Harry Herkowitz MD, David Montgomery, MD, Siddhorth A Badve MD, Casey Bachison MD, Steven Ericksen MD and Jeffrey S Fischgrund MD. *Predisposing factors for Dural tear in patients undergoing Lumbar Spine surgery.* J Neurosurg Spine 22: 483-486, 2015.
5. S Wolff, W Kheirredene, G Roudhon. *Surgical Dural Tears: Prevalence and updated management protocol based on 1359 lumbar vertebrae interventions.* Orthopaedic & Traumatology: Surgery & Research (2012) 98, 879-886.
6. Sin AH, Caldito G, Smith D, Rashidi M, Willis B and Nanda A : *Predictive factors for dural tears and cerebrospinal fluid leakage in patients undergoing lumbar surgery.* J Neurosurg Spine 5 : 224-227, 2006.
7. Wang Jc, Bohlman HH, Riew KD : *Dural tears secondary to operations in the lumbar spine. Management and results after two year minimum follow up of eighty eight patients.* J Bone Joint Surg Am 80: 1728-1732, 1998.
8. Deyo RA, Cherkin Dc, Loeser DJ, Bigos SJ, CiolMA: *morbidity and mortality in association with operations on lumbar spine. The influence of age, diagnosis and procedure.* J Bone Joint Surg Am 74: 536-543, 1992.
9. Kalevski SK, Peev NA, Haritonov DG : *Incidental dural tear tears in lumbar decompressive surgery: incidence, causes, treatment, results.* Asian J Neurosurg 5 : 54-59, 2010.
10. Luca Proitti, Laura Scaramuzzo, Giusappo K Schiro, Sergio Sessa and Carlo A Iogrosino : *Complications in Lumbar Spine Surgery . A retrospective analysis.* Indian J Orthop. 2013 jul-aug; 47(4):340-345.

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