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Anterior cervical discectomy and bone graft fusion - clinical presentation, post-operative outcome and complications

NEUROSURGERY

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ABSTRACT

Introduction: Cervical disc protrusion is one of the characteristic feature of degenerative changes. It includes dessication of cervical discs, irregular wear of facer joints, narrowing of facet joints. Reactive hypertrophy of facets, and thickening of interlaminar area and attendant inflammation of these regions. These changes are ubiquitous in the adult population.

Aims & Objectives: The present study is undertaken to analyze the clinical outcome and complications of anterior cervical discectomy and bone graft fusion.

Materials & Methods: Forty one patients with cervical compressive myelopathy due to disc prolapsed at single or multiple levels have been admitted, evaluated and operated by anterior cervical discectomy and bone graft fusion. We have analyzed and the detailed clinical evaluation and their neurological deficits have been recorded.

Results: A total of 97 cervical spine cases were operated, out of which 41 cases belonged to cervical discectomy with bone graft fusion. The incidence of these cases among cervical spine surgery in the present study is 42%, the male preponderance with 31 cases and female with 10 cases. Following surgery, patients were evaluated by Odom,s criteria. According this criterion, 26 out of 41 had an excellent outcome; 11 had a good outcome; 3 had fair outcome and 1 had poor outcome. In the present study, the patient presented with the features of Myelopathy, Myelo Radiculopathy and Radiculopathy with 39%, 41%, 20% respectively.

Conclusion: This study shows that the anterior cervical discsetomy and bone graft fusion for cervical disc prolapsed is cost effective and best method of management and it avoids further complications associated with instrumentation usage.

***Key words:* Anterior cervical discectomy and fusion, Cervical spine, Spondylosis**

Introduction

The cervical spine is a marvel of bioengineering that provides strong, flexible lifelong support and protection of neural elements. It is in constant motion during hours of activity. Cervical disc protrusion is one of the characteristic feature of degenerative changes, includes dessication of cervical discs, irregular wear of facer joints, narrowing of facet joints. Reactive hypertrophy of facets, and thickening of interlaminar area, as well as attendant inflammation of these regions. These changes are ubiquitous in the adult population. No surgical procedure can cure the natural progression of cervical spoindylosis, which is a normal part of aging process. The aging process is not a disease, and the term “Maturation” has a more the specific connotation than “Degeneration”. Anterior cervical discectomy and fusion (ACDF) is a standard procedure performed in patients with degenerative disc disease, disc prolapse and spinal canal stenosis. These ACDF techniques have been used for decades with high rates of success and were first reported by Robinson and Smith [1]. The indications for anterior cervical fusion (ACF) have also expanded to include the treatment of cervical realignment, trauma and tumour which facilitates spinal cord decompression and bone union hence it has been used to treat lesions with excellent reported treatment outcomes [2-5]. The complication rates have been reported to be 9.4 - 49% across all methods based on bone graft which

include pain, hematoma, infection, lateral femoral cutaneous nerve injury, ilium fracture, peritoneal perforation, hernia, and cosmetic problems [6-8].

Operations have been devised in which an anterior approach is used to gain access to the spine from the base of skull to the sacrum. The inventiveness has been particularly apparent in the cervical spine, where anterior approaches have undergone constant development. These approaches are most commonly used in the surgical treatment of the cervical radiculopathy or cervical myelopathy associated with cervical disc disease. The procedure of anterior cervical discectomy and bone graft fusion without instrumentation was suitable approach in government general hospitals where there are limited facilities and the procedure cost is effective. The procedures requiring instrumentation are cost involving and not affordable for a common man in a government set up. Another reason for following this approach is that instrumentation with plates and screws is a method of placing a foreign body, which can be avoided with this procedure. The present study is undertaken to analyze the clinical outcome and complications of anterior cervical discectomy and bone graft fusion.

Materials and Methods

Forty one patients with cervical compressive myelopathy due to disc prolapsed at single or multiple levels have been admitted, evaluated and operated by anterior cervical discectomy and bone graft fusion at Mamata General Hospital, Khammam during the period - August 2010 to March 2013. All these patients had cord compression anteriorly due to disc prolapse. All these patients underwent detailed clinical evaluation and their neurological deficits have been recorded. The clinical presentations have been classified as radicuolpathy, myelopathy and myeloradiculopathy. All these patients have been investigated with plain X-rays cervical spine and MRI of cervical spine. Postoperatively these patients were followed up every month for detailed clinical evaluation and X-ray cervical spine to assess the graft fusion. This study was carried with the prior approval from the Institutional Ethics Committee, Mamata Medical College, Khammam.

PROCEDURE

Operative Technique: Positioning and anaesthetic considerations: When the patient is under general anesthesia precautions were taken not to extend the patient's neck beyond voluntary range of motion which may jeopardize even more the narrow canal.

For anterior cervical approach the patients are positioned supine with neck neutral or if safe slightly extended. Admitted patients with myelopathy, Hypertension and resultant diminished spinal cord perfusion must be avoided and these require careful monitoring of fluid status and blood pressure.

Other Perioperative Preparation: Perioperative antibiotics reduce the occurrence wound infection provided the first dose is given before skin incision and that average is continued for 24hrs. We gave antibiotics pre and postoperatively to all the patients included in this series.

Anterior approach: Incision – the approach is always from right side. The location of incision is determined by palpating the cartilage, which lies at the level of C5 vertebral body. The incision is transverse one in a skin crease at appropriate level extending from midline to posterior border of sternocleidomastoid.

Approach to Spine: The skin incision should be continued through the platysma which is mobilized. The anterior border of sternocleidomastoid must be identified and fascia investing this muscle is incised at this point, so that the muscle can be retracted laterally. The middle layer of cervical fascia should be encountered. The omohyoid muscle is seen crossing the field at approximately level of C4 and usually this muscle is retracted superiorly or inferiorly. Sternocleidomastoid, carotid sheath and contents are retracted laterally. Strap muscles are mobilized and retracted medially. Trachea and oesophagus are retracted towards the midline to allow the palpation of anterior cervical spine. The prevertabral fascia over the spine may be opened in midline. The media edges of the longus colli muscles on each side should be elevated sharply and retracted laterally to provide maximum exposure of vertebral bodies and disc space. With an X-Ray, localization of disc space is done with a spinal needle. After on table radio graphic confirmation of the level of disc to be excised, the discectomy is started with incising the annulus fibrosis. Then, the nucleus pulposus is removed in piecemeal. The vertebral body and plates

adjpinning this disc space are then excised and osteophytes are excised with scoops and curettes during which the distraction at this disc space is maintained using a vertebral spreader.

An autogenous iliac crest tricorticate bone graft (configuration of graft: height-8 to 10mm, width-10 to 15mm and depth-10 to 13mm) of appropriate size is inserted & positioned properly into this disc space. After through hemostasis and wound cleaning, an on table cervical x-ray is taken to confirm the correct positioning of the bone graft. Then the wound is closed in layers. Postoperatively the patient should be checked for any new neurological problems. Patients are allowed to move the following day after placing philadeiphia collar. The collar was continued for 6 weeks. Follow up X-ray was taken every one month.

Results and Discussion:

A prospective study of 41 cases with cervical spondylosis, undergone discectomy and bone graft fusion is carried out at Mamata General Hospital, Hyderabad from August 2010 to March 2013. All the cases were operated by a single surgeon, to avoid the inter-surgeon variability. An analysis of clinical features and surgical outcome is discussed. A total of 97 cervical spine cases were operated, out of which 41 cases belonged to cervical discectomy with bone graft fusion. The incidence of these cases among cervical spine surgery in the present study is 42%.

Age incidence: Related to the age, maximum observed In between 40 – 50 years, minimum age noted at 37 years, maximum 55 years.

30 – 40 years	8	19.52%
40 – 50 years	21	51.22%
50 – 60 years	12	29.26%

Sex incidence: Showed the male preponderance with 31 cases and female with 10 cases

Presentation: The relative incidence of symptoms and signs

Myelo Radiculopathy	16	41%
Myelopathy	15	39%
Radiculopathy	9	20%

Spinal Level Involvement: Maximum involved at the level of C5-6 taking the percentage of 50.22%; C4-5 9.75%; C6-7 39.2%

Single levels	25	60.97%
Two levels	13	31.70%
Three levels	03	7.33%

(Single levels were operated whenever there is serve compression, myeloradiculopathy features with severe narrowing of foramen and loss of cervical spinal lordosis).

Neurological Outcome:

Following surgery, patients were evaluated by Odom's criteria [9]. According these criteria, 26 out of 41 had an excellent outcome; 11 had a good outcome; 3 had fair outcome and 1 had poor outcome.

Excellent	All preop. Symptoms relieved	26	63.6%
Good	Minimal persistence of Preop. Symptoms	11	26.4%
Fair	Definite relief of some preop. Symptoms	3	7.6%
Poor	Symptoms and signs unchanged or Exacerbated	1	2.4%

Complications:

Graft migration (Expired due to MI)	: 1
Disc space infection	: 1
Donor site complication	: Nil

The displacement of the graft was minimal (2 mm) and this patient has expired due to MI. One patient had disc space infection and presented with severe neck pain and restriction of neck movement. X-ray did not showed any changes, but ESR level raised with 150 mm/hour and treated with intravenous antibiotics and bed rest for which he responded.

Symptomatic: In the present study, the patient presented with the features of Myelopathy, Myelo Radiculopathy, Radiculopathy with 39%, 41%, 20% respectively. In Lunsford and colleagues [10] study showed 41% Myelo Radiculopathy, 40% Myelopathy and 19% Radiculopathy, in which our results are in accordance (Table: 1).

TABLE: 1. Comparison of symptomatic features

Symptoms	Present study	Lunsford study
Myelo Radiculopathy	41%	41%
Myelopathy	39%	40%
Radiculopathy	20%	19%

Disc involvement: Regarding disc distribution in this study showed the C5-6 – 50%, C6-7 – 40%; C4-5 – 10%, whereas, Lunsford et al reported the similar representation with C5-6 – 48%; C6-7 – 37%; C4-5 – 10% (Table: 2)

TABLE: 2. Comparison of Disc involvement

Disc involvement	Present study	Lunsford study
C5-6	50 %	48%
C6-7	40 %	37 %
C4-5	10%	10%

Surgical: In the present study, the surgical results were evaluated by utilizing the criteria set out by Odom et al [9]. Out of a total 41 patients, 90% had good or excellent results, 7.6% had fair results, 2.4% had poor results. When compared this with white Cloud series [11] based on Odoms criteria [9] which showed the 70% good and excellent results, 17% fair results, 9%, poor results where this shows far better results in our study. In Aronson report [12], 87% good or excellent results are comparable with my study. Some other series like Robertson [13] showed 80% of good and excellent results (Table: 3).

TABLE: 3. Comparison of Surgical outcome

Surgical outcome	Present study	White Cloud	Aronson
Excellent & Good	90 %	70 %	87 %
Fair	7.6 %	17 %	10 %
Poor	2.4 %	9 %	3 %

Complications: In this study, it showed only one case of Graft extrusion for 2 mm only, which is negligible and without any neurological deterioration, but this patient expired due to Myocardial infarction, this complication is of 2.4%, which is subsided with antibiotics after 4 weeks and there are no donor site complications or neurological deterioration. In other series like Flynn's [14] study showed 1.3% neurological deterioration. In other series of Bulger [15] showed 1% of recurrent laryngeal nerve injury, but in this study, there is no injury to recurrent laryngeal nerve. Graft displacement and non-union reported in Graham's report [16] by 5 – 6%, but in this study, its only 2.4%, i.e., only 2 mm displacement.

Other complications like Graft collapse, vascular injury, esophageal injury, cervical sympathetic injury are reported by Graham [16], in prseent study, such complications were not observed. Related to donor site complications (meralgia paresthetica – 14%, localized pain – 8%), Jeffrey and co-workers [17] reported 22% in this series, but no such complications are seen in this study (Table: 4).

TABLE: 4. Comparison of various complications

Complications	Present Study	Grahams	Burger	Flynn	Jeffrey series
Graft Extrusion	2.4%	5 – 6%	--	--	--
Disc space infection	2.4%	--	--	--	--
Recurrent Laryngeal Nerve injury	0%	--	1%	--	--
Neurological Deterioration	0%	--	--	1.3%	--
Donor site complications	0%	--	--	--	22%

"—": not mentioned

These results showed the possibility with anterior cervical discectomy and bone graft fusion without any displacement for which instrumentation is required which is related with cost, foreign body intrusion, infection, breakage of screws etc.

Conclusion

This study shows that the anterior cervical discectomy and bone graft fusion for cervical disc prolapse is a cost effective method which avoids further complications associated with instrumentation usage.

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Conflict of Interest: None