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Original Research Paper

Orthopaedics

IMMEDIATE POSTOPERATIVE RADIOLOGICAL OUTCOME OF ACDF IN CIVIL HOSPITAL, AHMEDABAD.

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ABSTRACT

Anterior Cervical Discectomy and Fusion (ACDF) is the most frequently performed surgical treatment for several cervical spinal diseases. Including herniated disc, trauma and degenerative diseases(5,8). We have collected data of 31 patients admitted and operated between November 2017 to June 2019 having degenerative cervical disc disease who underwent ACDF reinforced with anterior cervical plate(11,20). All ACDF operations were performed using Smith-Robinson anteromedial approach using a surgical microscope(5,16).

Approach Philadelphia collar were applied for 1 month post operatively. In our study we observed that ACDF achieves favourable radiologic results. The whole study data shows that there is a significant change in alignment of affected cervical spine after performing ACDF. Surgery related complications were not observed. No graft malposition, migration or mechanical failure of instruments.

OBJECTIVE: To evaluate radiologic result of anterior cervical discectomy and fusion.

METHODS: Retrospective review of clinical and radiological data of 31 patients. Cobb's angle, C1-C2 angle, C2-C7 angle, Vertebral height were measured and followed.

KEYWORDS :

INTRODUCTION

Anterior cervical discectomy and fusion (ACDF) is the most frequently performed surgical treatment for several cervical spinal diseases. Including herniated disc. Compressive myelopathy trauma and degenerative disease. After decompression of spinal cord or nerve roots, interbody fusion should be performed for spinal stabilization. Autologous bone has achieved favourable fusion but it results in an additional wound of the harvest side with risk of morbidity. Another fusion material is polyetheretherketone (PEEK) cage and has been used with or without anterior cervical plate augmentation. Without the anterior plate, higher subsidence rate has been reported. Besides the PEEK cage, allograft, autograft ACDF are usually performed with anterior plate augmentation.

MATERIALS AND METHODS

Patient Selection

TYPE OF STUDY – Retrospective study
SAMPLE SIZE – 31
INCLUSION CRITERIA-

- ACDF done for Single level disease
- No prior cervical surgery
- Cervical degenerative disease or intervertebral instability of discogenic origin with decreased segmental lordosis.

EXCLUSION CRITERIA-

- Multiple level disease requiring use of different impants on different segments to be treated.
- History of Posterior instrumentation.
- Major instability or traumatic instability
- Metabolic bone disease, major osteoporosis, severe osteopenia, osteochondrosis.

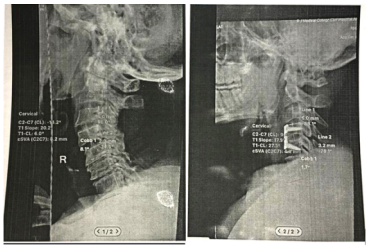
In our study we have collected data of 31 patients operated between November 2017 to June 2019 for having degenerative cervical disc disease underwent ACDF.

SURGICAL PROCEDURE

A single surgeon performed all operations with a standard Smith-Robinson anteromedial approach using a surgical microscope. After discectomy and decompression of the neural component, the graft bone was inserted into the disc space during gentle distraction of vertebral bodies. A Philadelphia neck collar was applied in all patients for 1 month after surgery.

RADIOGRAPHIC ASSESSMENT

Cobb's angle, C1-C2 angle C2-C7 angle
Vertebral height was measured using Cobbs method.
To assess the sagittal alignment using SURGIMAP app.



PREOP POSTOP

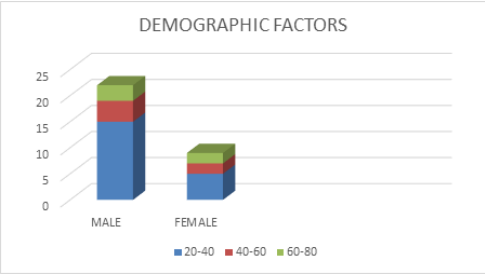
OPERATIVE STEPS :-

- Place the patient supine on the operating table with a small roll in the interscapular area.
- Rotate the patient's head slightly to the side opposite the planned approach.
- Vertically mark the anterior cervical skin, preferably using an exist- placing the adhesive surgical field drape. The hyoid (C3) cricoid cartilage (C6) are useful landmarks. The transverse-type skin incision can be used,
- even for three- level corpectomies if it is well placed; otherwise, an incision along the
- sternocleidomastoid border is useful. Throughout the exposure, meticulous hemostasis
- should be maintained to allow better identification of dissection planes and important
- anatomic structures.
- After sharply dividing the skin, sharply dissect the subcutaneous layer off the anterior
- fascia of the platysma to allow mobility of the wound to the desired level.
- Divide the platysma vertically near the midline by lifting it between two pairs of forceps and
- dividing it sharply in the cephalad and caudal directions. This allows exposure of the
- sternocleidomastoid border.
- Develop the interval just medial to the sternoclei domastoid to allow palpation and
- exposure of the carotid sheath and the overlying omohyoid muscle.
- Mobilize the omohyoid and retract caudally for access cephalad to C5 or mobilize cranially
- for access to C5 or caudal levels.
- Sharply divide the pretracheal fascia medial to the carotid sheath. Take care to avoid any
- dissection lateral to the carotid sheath that would place the sympathetic chain at risk.
- Once the pretracheal fascia has been incised, adequately develop the prevertebral space
- using blunt finger dissection directed medially and posteriorly.
- Place blunt hand-held retractors medially to view the paired longus colli muscles. To avoid
- injury to the midline structures, use bipolar cautery and small key type elevators to
- subperiosteally elevate the longus colli so that self-retaining retractors can be placed deep to
- the medial borders of these muscles.
- Obtain a localization radiograph using a prebent spinal needle to mark the disc space before
- proceeding with disc excision or corpectomy.
- If the superior or inferior thyroid vessels limit exposure, ligate and divide the vessels.
- Once all levels are adequately exposed, use a No. 11 blade scalpel to remove the anterior
- anulus at each level, cutting toward the midline from each uncovertebral joint.
- Remove the anulus with pituitary rongeurs and curets to allow exposure of each uncinate
- process, which appears as a slight upward curve of the endplate of the caudal segment. This
- marks the safe extent of lateral dissection to avoid the vertebral artery. Remove the anterior
- one half to two thirds of the disc at each level in this way.
- Use an operating microscope for safe removal of the posterior disc, osteophytes, or posterior
- longitudinal ligament as needed.
- If preoperative imaging demonstrates a soft disc fragment and this is found without violation
- of the posterior longitudinal ligament, further exploration of the canal is not warranted.
- If necessary, perform foraminotomy to remove uncovertebral tissue with small Kerrison
- rongeurs. If a defect through the posterior longitudinal ligament is found, enlarge it and
- explore the canal for additional fragments.
- If the surgical plan calls for complete removal of the posterior longitudinal ligament,
- complete all corpectomies first.
- Do not use unipolar cautery in close proximity to neural tissue.
- Thin the cortical bone with the high-speed burr and
- remove with angled curattes, or remove carefully with the burr. If necessary, remove the
- posterior longitudinal ligament by lifting it anteriorly with a small blunt hook and opening
- the epidural space with a 1-mm Kerrison rongeur. This must be done with excellent
- visualization and care to avoid dural injury.
- After the epidural space is entered, remove the posterior longitudinal ligament entirely if
- needed. If the canal is significantly compromised, carefully free it from the underlying dura
- with blunt dissection.
- Perform foraminotomies at this time and remove osteophytes if necessary. A small blunt
- probe should pass easily anterolaterally after foraminotomy. When possible, pre- serve the
- posterior longitudinal ligament to enhance construct stability.
- Carefully prepare the adjacent endplates so that all cartilage is removed, subchondral bone
- is preserved, the entire decompression is the width of the endplate between the uncinate
- processes, and the endplates are parallel to one another.
- Carefully measure the anterior to posterior dimension at each endplate. The graft depth
- should be 3 to 4 mm less than the shorter of the two to allow the graft to be recessed 2 mm
- anteriorly and not compromise the spinal canal posteriorly. Also, carefully measure the
- length of graft needed in the cephalad to caudal dimension. Remember to measure with and
- without traction being applied through the head halter so that the graft will be under proper
- compression. Also, make sure at this point that endplates are parallel to one another.
- Remove the disc laterally to allow visualization of the uncinate process bilaterally, which
- will appear as a slight upturning of the endplate and marks the safe extent of lateral
- decompression.
- Obtain a tricortical iliac graft using a small oscillating saw.
- During preparation of the endplate, take care to preserve the anterior cortex of the cephalad
- and caudal vertebrae.
- Fashion the bone graft to the appropriate depth. Position the graft with the cancellous
- surface directed posteriorly and bevel the cephalad and caudal posterior margins slightly to
- facilitate impaction. With traction applied, impact the graft into place so that the cortical
- portion is recessed 1 to 2 mm posterior to the anterior cortex of the vertebral bodies. There
- should be 2 mm of free space between the posterior margin of the graft and the spinal canal.
- The graft should fit snugly even when traction is being applied.
- Release traction and check the fit of the graft using a Kocher clamp to grasp it. Repeat this
- procedure for each additional disc space.
- Obtain intraoperative radiographs to verify graft and hardware position.
- Close the platysmal layer over a soft, closed-suction drain

and close the skin and subcutaneous layers. Apply a thin dressing. Place the patient in a cervical orthosis before extubation.

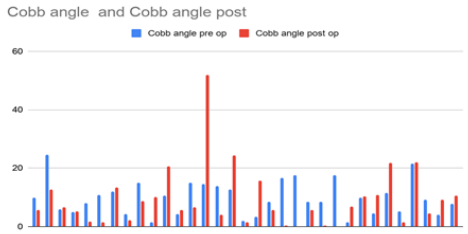
RESULTS

DEMOGRAPHIC FACTORS



COBB'S ANGLE :-

Cobb's angle	Average	Standard Deviation	Varience
Pre op	3.99	7.69	34.22
Post op	9.29	10.49	55.40

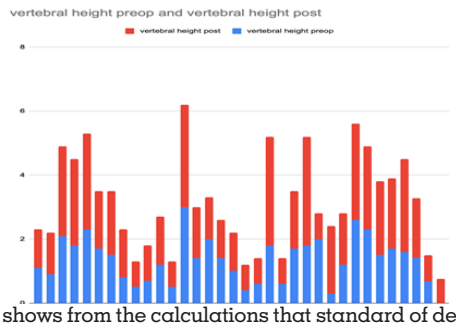


Here it shows from the values that standard of deviation of Cobbs angle post operatively is relatively lesser as compared to that of pre operative cobs angle value.

VERTEBRAL HEIGHT :-

Difference Scores Calculations.

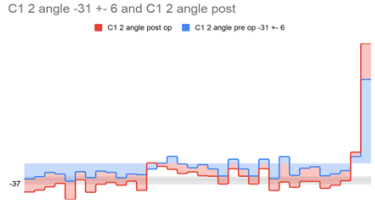
Vertebral height	Average	Standard Deviation	Varience
Pre op	1.41	0.68	0.87
Post op	1.85	0.80	0.74



Here it shows from the calculations that standard of deviation of Vertebral height post operatively is relatively more as compared to that of pre operative Vertebral height.

C1-2 ANGLE :-

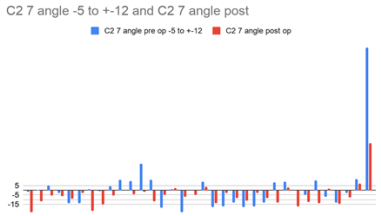
C1-2 angle	Average	Standard Deviation	Varience
Pre op	13.26	12.36	152.79
Post op	18.34	8.06	65.10



Here is shows from the values that standard of deviation of C1-2 angle post operatively is relatively lesser as compared to that of pre operative C1-C2 angle values.

C2-7 ANGLE :-

C1-2 angle	Average	Standard Deviation	Varience
Pre op	-2.81	12.40	153.99
Post op	-7.97	7.12	50.71



Here it shows from the values that standard of deviation of C2-7 angle post operatively is relatively lesser as compared to that of pre operative C2-C7 angle values.

DISCUSSION :-

- ACDF is the most favourable and familiar method for treatment of cervical degenerative diseases, and also for trauma. Myelopathy or radiculopathy is treated with decompression of neural elements, and osseous fusion is established to stabilize the cervical spine. There have been many studies about several fusion materials and plate augmentation, but they are still controversial.
- Achievement of fusion without associated instrument complicating may be the most factorable result in radiologic assessment, and this may also be correlated with clinical outcome. Non-union or mechanical failure of instrument causes pain or neurologic symptoms, and rarely dysfunction and injury of the esophagus or prevetebral tissues. Sometimes these complications may be treated by revision surgery which also has its own surgical risks.
- In the current study evaluation of cervical lateral radiographs pre operatively and post operatively was done for change in alignment and assessed whether fixation with decompression results in an acceptable or rather improved alignment which includes C2-7 alignment sagittal angle, C1-2 angle, Cobb angle of affected disc space, and vertebral height.
- Results shows that means C1-2 angle in pre operative group was -13.26 as compared to post op which was -18.34 which means that average angle has improved towards normal by around 5.1 degrees. The difference C1 C2 angle in both groups was found significant as $p=0.029$ (<0.05). This may be due to the fact that due to change of cob angle of affected vertebra the C2-7 alignment changes and in turn C1-2 angle also depends on C2-7 alignment as seen with other studies, it improves.
- Now if the difference of C1-2 angle from normal (which is taken as -31 degrees) we find that pre operative average of difference was -17.81 as compared to post op which was -12.65 which shows that difference has decreased which means it moves towards normal side by 5.16 degree which is same as we earlier observed.
- Also the variability and standard deviation in pre op and post op patients differ significantly. The decrease in Standard deviation was 4.3 and decrease in variance was 85.69, which shows that also the variation present pre operatively has decreased and has become a more constant value.
- Moving on to C2 – C7 alignment we found the average angle of pre op patients was -2.81 degrees as compared to post op which was -7.97 degrees which both are in normal range (-5 +- 12), But variability and standard deviation in post op group decreases, in pre op standard deviation in

12.40 as compared in 7.12 in post op and variability in pre op is 153.99 as compared to 50.71 in post op, which again shows constancy after fixation and less variation. The difference in both groups is significant as p=0.042 (<0.05)

- Regarding vertebral height it shows that pre op group averaged at 1.41 mm (which is not an absolute Value) and post op average was 1.85mm which shows an average of increased vertebral height post op of about 37%. Resultant average of difference in height was 0.43 mm which is about 8.6%.
- This shows increase in the height post operatively which is expected as in both traumatic and myelopathic cervical spine the vertebral height is less than normal and an increase is suggestive of good decompression. Obviously keeping in mind that over distraction should be avoided at all costs. The difference among both groups in terms of change in vertebral height is also significant as p=0.00037 (<0.05)
- Cobb's angle was also measured at the affected vertebral level and is also an important radiological guide in assess fixation quality and correction. Pre operative group averaged at 3.99 degrees, while post op averaged at 9.29 degrees, which shows an increased cob angle of 5.3 degrees. It's hard to say how this change would affect the outcome but it is important to consider when following up and evaluating fusion and subsidence, and local kyphosis. The average difference of cobb's angle between both groups came out to be 0.832 degrees.

COMPLICATIONS :-

Surgery-related complications were not observed. No graft malposition, migration, or mechanical failure of instruments was observed, and there was no revision surgery.

CONCLUSION :-

ACDF with allograft bone block and plate augmentation achieves favourable radiologic results, which is seen in immediate post operative radiographs. This includes improved alignment of cervical vertebrae and increase in height post operatively. We hypothesise that to a certain degree, the maintenance of these parameters could contribute to reduce development of adjacent level change. A longer period of evaluation is needed, to see if all these radiographic changes will translate to symptomatic adjacent level disease, and to see the fusion rates.

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