RESEARCH PAPER | Orthopedics | Volume : 4 | Issue : 10 | October 2014 | ISSN - 2249-555X

COMPARISON OF TRICORTICAL AUTOGRAFT TO ARTIFICIAL BONE GRAFT IN ANTERIOR CERVICAL DISCECTOMY AND FUSION WITH RIGID PLATE FIXATION

KEYWORDS: Anterior cervical discectomy and fusion; plating; graft.

Dr VINOD GAUTAM
Professor orthopedics, B J Medical College and civil hospital ahmedabad

Dr MANISH DIWAKAR
3rd year resident orthopedics, B J Medical College and civil hospital Ahmedabad

Dr SAGAR HANSALIA
3rd year resident orthopedics, B J Medical College and civil hospital ahmedabad

Dr GAURAV KALARIYA
2rd year resident orthopedics, B J Medical College and civil hospital ahmedabad

Dr NITIN DARGAR
2rd year resident orthopedics, B J Medical College and civil hospital ahmedabad

ABSTRACT *Introduction : Anterior cervical discectomy and fusion (ACDF) has become an accepted procedure for decompression of neural elements and spinal stabilization in the treatment of degenerative disease, trauma, tumors and cervical tuberculosis. Selection of appropriate graft substrate to optimize fusion rate and healing is essential. The present study was undertaken to determine the effectiveness of artificial graft versus tricortical autograft in fusion and clinical outcome. Materials and methods: A retrospective radiographic and clinical review to assess fusion and clinical outcome in thirty patients who underwent ACDF with anterior plating between April 2011 and Jan 2013 at our hospital, were included in the study. Sixteen patients (53%) had autogenous tricortical iliac crest bone graft and fourteen patients(47%) received artificial (tricalcium phosphate) bone graft. Follow up lateral neutral, flexion and extension radiographs were used to assess fusion at six months . The radiographs were reviewed by an independent blinded observer in assessing fusion as per Bridwell criteria. Clinical outcome were rated excellent, good, fair and poor based on Odom's criteria. Results: Radiographic fusion was assessed in all patients and it was found that 70% patients of autogenous bone graft had grade 1 fusion compared to 56% in artificial group. In contrast 8% patients had grade 4 fusion in artificial group compared to none in autogenous group. Clinical outcome was excellent in 53% patients. Conclusion: A high fusion rate (64%) was obtained for ACDF with plating with either autograft or artificial graft. In the study, grade 4 fusion occurred in one patient with artificial graft but this was not significant. Excellent and good clinical outcome was noted in 76% patients. Proper patient selection and meticulous operative technique is essential to obtain high fusion rates and optimal clinical outcome which is equally important as graft type.*

INTRODUCTION:

Since initially reported in 1955 by Robinson and Smith ,anterior cervical discectomy and fusion (ACDF) has become an accepted procedure for decompression of neural elements and spinal stabilization in the treatment of degenerative disease, trauma and tumors of the spine. Successful arthrodesis is instrumental in obtaining optimal outcome in ACDF. Selection of the appropriate graft substrate to optimize fusion rate and healing is essential. Various systemic factors, operative technique, plate type and work-related injuries are further components that can affect osseous fusion and clinical outcome.

For fusion, various options, such as autografts, allografts, ceramics, Polyetheretherketone (PEEK) cages, and titanium cages are available. The selection of the appropriate graft substrate is imperative to achieve successful bone fusion and an optimal clinical outcome.

However, there are multiple disadvantages associated with each graft type.The harvest site for autogenous iliac crest bone grafts is associated with limited quantity of 50-55 cm, patient dissatisfaction with the cosmetics of the iliac crest, blood loss, hematoma and arterial injury, nerve injury and numbness, hernia formation, infection, fracture and pelvic instability and chronic pain at donor site.

Disadvantages are also associated with allograft and include histocompatibility differences that may affect proper healing, increased risk of infection, lack of availability, size variations and possible structural weakness. The use of artificial graft does avoid harvest site morbidity, is available in desired quantity, can be configured, decreases hospitalization time and reduces costs ;but its superiority over other grafts in augmenting fusion is a matter of debate.

AIMS AND OBJECTIVES:

The purpose of this study was to ascertain fusion rates and clinical outcome in patients undergoing single level ACDF with rigid anterior plate fixation with either artificial graft(tricalcium phosphate) or tricortical iliac autograft.

MATERIALS AND METHODS:

Thirty patients who had undergone single level ACDF due to any cause within the past 2 yrs from April 2011 to April 2013 aged less than fifty years at civil hospital Ahmedabad were included in the study.Patients having any of the post operative complications like infection, graft ex-

Volume : 4 | Issue : 10 | October 2014 | ISSN - 2249-555X

trusion, implant loosening etc and chronic alcoholics and smokers were not included.

Out of these; 16 patients(53%) had tricortical iliac autograft and 14 patients(47%) had artificial bone graft.

All the procedures were performed by means of a standard left-sided Smith-Robinson anteromedial approach to the cervical spine.

All the patients had artificial graft of the same composition(tricalcium phosphate) and from the same manufacturer(Bio -Techma SBM ,France).All the patients were fixed with SMPL titanium locking plate and screws. All these patients were routinely followed up till six months. At each follow up AP and lateral radiographs were taken and the radiographs at six months were assessed by a blinded observer for assessing the grade of fusion. The fusion grades were assessed as per Bridwell criteria.

FIGURE 1 ARTIFICIAL GRAFT

Anterior fusion grades	
Grade I	Fused with remodeling and trabeculae
Grade II	Graft intact, not fully remodeled or incorporated, though no lucencies
Grade III	Graft intact, but definite lucency at the top or bottom of the graft
Grade IV	Definitely not fused with resorption of the graft and with collapse

TABLE 1.Bridwell criteria for assessing fusion

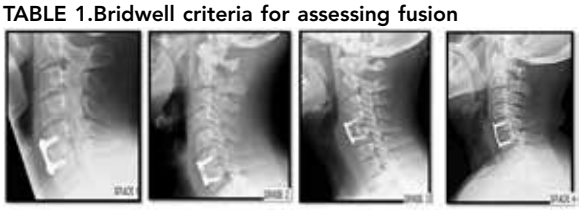

FIGURE 2 BRIDWELLS GRADES OF FUSION

Since mere radiographic evaluation not a reliable means of assessing fusion; patients were also assessed clinically for fusion outcome at six months by ODOM'S clinical outcome ratings.

Excellent	No complaint referable to cervical disease; able to perform daily occupation without impairment
Good	Intermittent discomfort referable to cervical disease; no significant interference with work
Fair	Subjective improvement in symptoms; physical activity significantly impaired
Poor	Worsening or no improvement

TABLE 2. ODOM'S clinical outcome ratings

4. OBSERVATIONS AND RESULTS:

After six months of follow up the data was analyzed as follows:

a) Etiology : out of the thirty patients included in the study; etiology was as follows:

Etiology	Autograft	Artificial	Total
Degenerative	7	6	13(43%)
Kochs	3	3	6(20%)
Traumatic	6	5	11(37%)

b). Patient profile: the patients were distributed as follows:

> age distribution

< 25	25- 50
8(27%)	17(73%)

Mean age : 34.3yrs

c).Fusion rates:

Grade	Autograft	Artificial	TOTAL
1	11(70%)	8(56%)	19(64%)
2	4(23%)	3(21%)	7(23%)
3	1(7%)	2(15%)	3(10%)
4	0	1(8%)	1(3%)

d).Clinical outcome

Grade	Autograft	Artificial	Total
Excellent	9(60%)	7(54%)	16(53%)
Good	4(20%)	3(23%)	7(23%)
Fair	2(13%)	2(16%)	4(13%)
Poor	1(7%)	2(7%)	3(10%)

Volume : 4 | Issue : 10 | October 2014 | ISSN - 2249-555X

e).Clinical outcome etiology wise Autograft

Etiology	Excellent	Good	Fair	Poor
Degenerative	6	1	0	0
Kochs	2	1	0	0
Traumatic	1	2	2	1

Artificial graft

Etiology	Excellent	Good	Fair	Poor
Degenerative	4	2	0	0
Kochs	2	1	0	0
Traumatic	1	0	2	2

5. DISCUSSION:

A high fusion rate (19 out of 30, 64%) was obtained for single level ACDF with rigid plate fixation using either autograft or allograft at 6 month follow up.

In the study grade 1 fusion occurred in 70% patients in autograft and 56% in artificial group but this result was statistically not significant(p value >0.05)

On the contrary grade 4 fusion occured in 1 patient with artificial graft compared to none in autograft group.

Excellent and good clinical outcome was noted in 23 out of 30 patients .Good clinical outcome was consistent with the high grade of fusion.Some of the cases in artificial group were low in fusion grades but clinically improved well indicating that mere radiological assessment of fusion is not a reliable measure.

On the contrary there were also patients who had high grade of fusion but clinically the were not relieved of symptoms emphasizing the importance of proper patient selection and operative technique.

Of all the surgeries performed; degenerative cases improved most and traumatic cases improved the least in both the groups indicating that proper patient selection is important for optimal results.

6. CONCLUSION:

Although at six months follow up fusion rates are higher in autograft group but other long term studies are required to include delayed union in both the groups and also to account for any long term side effect of grafts.

Proper patient selection and meticulous operative technique is also essential in obtaining high fusion rates and optimal clinical outcome beside the type of graft chosen.

Till substantiated by other long term studies it can be concluded that tricortical iliac autograft certainly have an edge over tricalcium phosphate artificial grafts in assisting fusion.

REFERENCE [1] Robinson R, Smith G. Anterolateral cervical disc removal and interbody fusion for cervical disc syndrome. Bull Johns Hopkins Hosp 1955;96:223–4. | [2] Bishop RC, Moore KA, Hadley MN. Anterior cervical interbody fusion using autogeneic and allogeneic bone graft substrate: a prospective comparative analysis. J Neurosurg 1996;85:206–10. | [3] Riley LH, Robinson RA, Johnson KA. The results of anterior interbody fusion of the cervical spine. Review of ninety-three consecutive cases.J Neurosurg 1969;30:127–33. | [4] Robinson R, Walker A, Farlic D, Wiecking D. The results of anterior interbody fusion of the cervical spine. J Bone Joint Surg [Am] 1962;53:1–11. | [5] White AA, Southwick WO, Deponte RJ, Gainor JW, Hardy R. Relief of pain by anterior cervical spine fusion for spondylosis. A report of sixty-five patients. J Bone Joint Surg [Am] 1973;55:525–34.