

# USE OF SYNTHETIC BOP GRAFT (BIO COMPATIBLE OSTEO CONDUCTIVE POLYMER) IN ANTERIOR CERVICAL DECOMPRESSION SURGERY

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## SUMMARY

Forty adult patients treated surgically for cervical disc herniation, osteophyte and fracture subluxation, between April 1993 and April 1994, were studied. An anterior cervical approach, with Cloward's procedure, was used. For inter-body fusion, after decompression, a BOP (biocompatible osteoconductive polymer) graft was used. Post-operatively all patients had a plain-x-ray of the cervical spine before mobilization. The plain x-ray was then repeated at six months following surgery. C.T. scans were performed on 10 patients, to clarify some of the doubts on the six months follow up x-rays. No cases of toxicity or infection were observed. The clinical state and radiological findings on the follow up are discussed. The follow up period ranged from 6 to 24 months. The use of the BOP graft as an alternative to other graft, especially the iliac crest graft, has also been discussed.

## INTRODUCTION

Inter-body fusion following anterior cervical decompression seems logical, and has been practiced for more than three decades.<sup>1,2</sup> The Iliac Crest graft has been extensively used, but the prolonged operation time, increased pain at the donor site with less mobility, associated complications and prolonged hospital stay has prompted search for alternative methods.

The alternative grafts, such as freeze-dried bone grafts and corals, have their own advocates.<sup>3</sup> Following the work of Brotchi et al 1987<sup>4</sup> and Lozes et al 1989<sup>5</sup> interest has been taken in the BOP (biocompatible osteoconductive polymer) graft. Our work covers 40 patients between April 1993 and April 1994. We hope this will further stimulate studies on the subject of which is the best graft to use following anterior cervical decompression.

## MATERIAL AND METHODS

Forty patients operated on through an anterior cervical approach between April 1993 and April 1994 included 21 males and 19 females. The age ranged between 39 and 87 years. The preclinical state of the patients was graded on the Nurick's Grading system of cervical myelopathy.<sup>6</sup> (Table I-II) Eight patients had a history of acute trauma with immediate development of symptoms and signs. In nine patients the symptoms developed spontaneously, and in 23 patients the disease had a progressive history. In the 23 patients with progressive disease, 4 patients had trauma to the neck in the past, several years before the onset of symptoms and signs, of cervical spondylosis. Spinal stenosis was present in 5 patients. The most common level was C5/6 (20 patients). Eight patients had double level disease, in which C5/6/7 were the

common levels. Twenty two patients had disc and osteophytes while sixteen patients had disc prolapse only. In one patient there was a fracture subluxation, and one patient had osteophyte only. The patient with the fracture subluxation had this at C3/4 level, and in this case a C4 carpectomy with insertion of a BOP graft and anterior plating was done. Diagnosis was established on clinical examination, CT Myelogram and MRI. Twenty two patients had MRI and 18 patients had CT Myelogram.

### Operation

Operation was performed using the standard approach described by Cloward.<sup>2</sup> Through a right side oblique cervical incision the space medial to the Sternomastoid, and above Omohyoid muscle was opened and deepened to the pre-vertebral fascia. The Trachea and the Oesophagus were retracted medially and the Carotid artery laterally. The pre-vertebral fascia was opened and the Longus coli muscle separated. A spinal needle was inserted in an appropriate disc space and the level confirmed by the lateral cervical radiograph. A 12-14 millimeter (mm) diameter hole was drilled to depth of 15 mm. The remaining part of the bone and osteophytes along with the disc remnant were curetted out and the posterior longitudinal ligament was then exposed and incised to decompress the Dura and adjacent nerve root sheath. A BOP graft of the same size as the hole created was then inserted and left flush with the anterior surface of the adjacent vertebrae. Haemostasis was secured and a suction drain inserted and connected to a close drain system. The wound was closed in layers. The patient was mobilized the following day after surgery confirming the state of the graft and the cervical spine with the help of a plain cervical spine x-ray.



### Follow-up

All patients had a second cervical spine x-ray taken six months after the procedure.



TABLE – I  
NURICK'S GRADE OF CERVICAL  
MYELOPATHY

Nurick's Grade	Definition
0	Signs and symptoms of root involvement only; no evidence of cord disease.
I	Signs and symptoms of cord disease. No difficulty in walking.
II	Slight difficulty in walking - able to continue working.
III	Difficulty in walking preventing employment. Inability to do housework.
IV	Can walk with a stick or frame.
V	Chair-bound or bed-ridden.

Ten patients had CT scan depending to the findings of plain cervical x-ray. The follow up period ranged from 6 to 24 months. The post operative clinical state was measured on the Lunsford grading scale.<sup>7</sup>

## RESULTS

Twenty eight patients had good results in the form of complete disappearance of the symptoms, with normal activity (Lunsford classification). 7 patients had a fairly good results and 5 patients had a bad results. There were fourteen patients in NO (Nurick's Grading), out of them thirteen patients had good results and one patient had a fairly good result. Among the fourteen patients in N-I, 11 had good results and three patients had a fairly good result. Out of the six patients in N-II, four patients had good results, one patient had a fairly good result and one patient had a bad result. Of the three patients in N-III, one had a fairly good result, and two patients had poor results. The two patients in N-IV, there was a fairly good and bad result each. The only patient in N-V had a poor result. Among the five patients in the bad result group, there were

TABLE – II  
LUNSFORD CLASSIFICATION

I.	Good results	Complete or partial improvement of symptoms with full activity.
II.	Fair Results	Improvement after surgery with persistent limitation of activity.
III	Poor Results	Either no improvement or deterioration after surgery.

two patients in N-III and one patient each in grade II, IV and V. One of these bad result patients has been diagnosed as suffering from multiple sclerosis, and his follow up MRI did not show any abnormality of the cervical spine attributed to surgery. Two of the bad result patients had a double level Cloward at the level of C5/6/7. Preoperatively they were on Grade IV and V each. Among the other double level Cloward procedures four patients had a good result and two patients had fair result. Among the eight patients with acute trauma, one patient with grade N-III had a poor result, 3 patients in Grade N-O had a good result, and two patients in N-I had a good and fair result each. Two patients in N-II had good results, while one patient in Grade N-IV had fair result. No case of any local infection or toxicity was recorded. None of the patients had medical complications such as deep vein thrombosis or pulmonary embolism. All patients were mobilized on the following day, and all of them were given simple analgesics if they were complaining of pain in the neck.

## DISCUSSION

Cervical spondylosis leading to neurological symptoms and signs has been commonly treated by anterior cervical decompression. The Cloward procedure<sup>1</sup> is the most commonly used procedure for the cervical spondylosis. The role of the interbody fusion following anterior cervical

decompression has been widely accepted, although anterior cervical decompression with no graft and decompression with the use of metal work has its own advocates.<sup>8</sup> The problem with graft expulsion and morbidity with the autograft is well documented.<sup>9</sup> However, most surgical practices use the graft taken from the iliac crest.<sup>10</sup> This has got its own related complications in the form of increasing operation time, prolonged use of analgesics, less mobility with associated complications such as deep vein thrombosis and pulmonary embolism and an extra scar at the donor site.<sup>11</sup> Alternatively, using the bone bank has its own potential for transmitting infectious diseases.<sup>12</sup> Heterografts with its potential for unreliable results, in the form of poor fusion has been the choice of some people. The interest in the biomaterial ceramics, corals and hydroxy apatite has been used in trauma and orthopaedics surgery with its own advantages.<sup>3</sup> The BOP has been used in the Eastern Block countries with gratifying results.<sup>13</sup> In the BOP the hydrophilic molecules (N-Vinyl Pyrolidone) and the hydrophobic molecules (methyl methacrylate) makes it biodegradable.<sup>14</sup> The polyamide fibers provide the biomechanical properties of it. When BOP is inserted, its degradation leads to gradual formation of cavities, which invaded by the vascular tissue, which then builds the graft bed for ossification.<sup>4</sup>

Regarding the clinical state of the patients, 28 patients had good, 7 had fair, while 5 patients had poor results. The poor outcome results were related to the pre-operative bad grading on the Nurick's grading system. Our results did not show any relation of the outcome with the level of the operation. No cases of graft expulsion, infection or toxicity have been observed. Ossification of the BOP graft takes longer than the Iliac Crest Graft but the stability of the spine is in comparison to that of using other forms of grafts. The BOP has excellent acceptance by the patient

and has reduced operation time. The second operation site is avoided. The BOP is available in different shapes and sizes with unlimited quantities.

The interest in the biotechnological advances is encouraging. The results obtained by using the grafts are promising. The early post operative problems with the Iliac Crest graft are avoided. Further study both in the field of biomaterial manufacturing and its clinical use will be appreciated in future.

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