The Use of Acrylic Plastic for Vertebral Replacement or Fixation in Metastatic Disease of the Spine*

Technical Note

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Acrylic plastics have been used extensively in the repair of skull defects\cite{10, 12} and have been tried not too successfully as replacement therapy for worn-out intervertebral discs\cite{2, 3} for internal fixation in fractures, and in arthritic spines.\cite{1-4, 7-9, 11} Dott of Edinburgh\cite{3} mentioned his use of acrylic plastic in atlanto-axial subluxation from rheumatoid arthritis, and his associate Harris\cite{4} has written of further uses including the fixation of fractures of the cervical spine.

Clinical and animal work has shown that acrylic plastic properly used is no more irritating than vitallium or stainless steel and that the heat of polymerization is a handicap only when in direct contact with delicate nerve structures or when uncooled by cold saline irrigation.

With these facts in mind, it occurred to us that acrylic polymer might well constitute a rapid method of vertebral internal fixation or replacement in spinal metastatic disease where the patient has only a limited life expectancy and should not spend his last months immobilized in bed in casts or traction. This is a preliminary report on its trial in three such cases, plus confirmatory animal studies.

Case Reports

Case 1. A 59-year-old woman had metastatic breast carcinoma with lytic collapse of the 2nd cervical vertebra and cord compression. She was hospitalized on April 11, 1963. She had severe neck pain and pyramidal tract signs. There was also metastatic invasion of the skull, lower cervical spine, skin, and liver.

Operation. Immediate hypophysectomy was followed by 5 days of skeletal traction. Subsequently, under local anesthesia and continuing traction with the patient in the lateral decubitus position, the atlas and axis were rapidly exposed. Heavy wires were twisted around the laminae and passed through bilateral suboccipital burr holes (Fig. 1). With these as a framework, the atlas and axis were then encased in acrylic plastic.

Postoperative Course. The patient’s recovery was uneventful, and she was discharged from the hospital on the 10th postoperative day fully ambulatory and relieved of her pain and long tract signs. She received outpatient radiation and returned to her secretarial work on the 14th day, living an active life for the ensuing 2½ years. Ultimately, recurrence and spread occurred with further collapse of the 5th cervical vertebra and further subluxation of the atlas. Death resulted from respiratory paralysis aggravated by pneumoencephalogram.

Postmortem examination revealed no tissue or bone reaction secondary to the acrylic plastic inlay. There was extensive skeletal and skin spread of the carcinoma.

Case 2. This 44-year-old man was admitted to the Hartford Hospital under the care of Dr. Henry Williams for multiple myeloma with neck and arm pain, paresthesia of the hands, and asymmetry of the arm reflexes with marked destruction and collapse of the 7th cervical vertebral body.

Operation. An acrylic plastic posterior encasement of the 5th, 6th, and 7th cervical and 1st thoracic vertebrae and laminae was carried out using heavy wire as a matrix (Fig. 2). The operation was performed under local anesthesia, in a sitting position, followed by local radiation.

Postoperative Course. Immediate ambula-
tion was carried out without incident, and the patient was discharged from the hospital on the 7th postoperative day. He used a lightweight collar when doing outdoor activity but returned to normal life and work for $1\frac{1}{2}$ years with relief from his previous arm pain. Sudden death supervened from a myocardial infarction with pulmonary infarcts and multiple myelomatous involvement of lungs, liver, and kidneys, revealed at postmortem examination.

The cervico-dorsal acrylic encasement was found to be well fixed; there was no inflammation or other reaction in the cord or surrounding tissue. All of the spinal vertebral marrow had a generalized moth-eaten appearance from primitive plasma cell infiltration.

Case 3. This 71-year-old woman experienced a rapid downhill course from malignant lymphoma which eroded the 4th and 5th cervical vertebral bodies resulting in cord compression and paralysis of the right biceps and deltoid muscles (C-5 root) and right leg (Fig. 3).

Operation. Decompression of the cord and root was carried out through anterior resection of the 4th and 5th cervical bodies with replacement by an acrylic plastic prosthesis. A postoperative tracheotomy was performed.

Postoperative Course. Immediate neurological recovery was noted in the paralysis of the deltoid and biceps muscles and in the spastic paralysis of the right leg. The patient succumbed on the 15th postoperative day from septic pneumonitis. Postmortem ex-