

A Survey of European and Scandinavian Bone Grafting Procedures for Cleft Palate Deformities

RICHARD C. SCHULTZ, M.D.

Des Plaines, Illinois

The basis of this survey consists of one year (1960–1961) spent in Scandinavia and Europe touring the various plastic surgery centers where bone grafting procedures were performed. The majority of this time was spent with Professor Tord Skoog at the University of Uppsala, Sweden. It should be stated initially that I found among all the centers which I visited a thorough familiarity with the standard methods of surgical repair and rehabilitation of cleft palate deformities as advocated by Veau, Wardill, Kilner, Rosenthal, and Sanvenero-Rosselli. I was impressed by the enthusiasm in certain centers for the bone grafting of selected cleft palate defects.

Whereas bone grafting is only a technical undertaking, the success of which depends upon the adherence to certain definite surgical principles, the philosophy originates in an attempt to replace bony substance where normally present bony substance is congenitally absent. It is well known that the usual cleft of the palate and bony maxilla is not just a division of these structures but that there is often an absence of tissues, or at least a failure of development of portions of these tissues. If this fact is accepted, one can easily see that a basic principal of reconstructive surgery is involved; that is, to replace absent tissue with like autogenous tissue whenever possible.

The aims of bone grafting clefts of the hard palate seemed to be: a) To provide an improved stable dental arch; b) To provide stability to the lateral maxillary segments; c) To provide more normal palatal resonance for speech; and d) To provide a bony framework for surgical improvement in facial features. (I refer specifically to the typical depressed alar deformity and the associated apparent maldevelopment of portions of the middle third of the face seen in some cleft palate patients.) These aims appeared to be best accomplished by a close working relationship between the orthodontist and the plastic surgeon.

Dr. Schultz is Instructor in Surgery, University of Illinois College of Medicine, in Chicago.

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Historically, this work first began in 1944 with E. Schmidt in Stuttgart who used certain principles of Vassmund and Schuchardt. Subsequently this became modified and popularized by Bengt Johanson and Karl-Erik Nordin in Stockholm in 1954. The earliest cases of bone grafting of cleft palate deformities now have a 19 year follow-up. This obviously is not a recently adopted experimental surgical procedure, without time for evaluation, as claimed by some American clinicians.

Dr. E. Schmidt, a 'Kiefer und Gesicht Chirurgen', began this work by implanting bone and cartilage in palatal defects from war injuries using tube flaps as carriers. Relative to congenital cleft palate deformities, Schmidt frequently observed a hypoplasia of the isolated lateral maxillary segments. He has emphasized in his first papers that in certain conditions some collapse of the dental arch is desirable in the rehabilitation of these cleft palate patients. Specifically, this collapse is desirable where the premaxilla is rotated markedly forward or where the premaxilla is rotated to the noncleft side. Schmidt originally used rib with attached chondral cartilage to prevent alveolar collapse where he thought this was undesirable and to elevate the associated depressed nostril. He has recommended that the bone grafting procedure be performed in infants at approximately three to six months of age. He repairs the cleft lip at the same time that he performs the bone graft. He manages the protruding premaxilla in the bilateral cleft by lip closure only and then, in uncomplicated cases, bone grafts the bilateral clefts in two stages.

Professor Karl Schuchardt of Hamburg also a 'Kiefer und Gesicht Chirurgen,' uses essentially the same approach and technique as Schmidt. He has emphasized, however, a double layer soft tissue pocket to receive the bone graft. Schuchardt uses a notched full thickness section of rib for insertion into the maxillary cleft. He advocates that the orthodontic work follow successful bone grafting. Schuchardt has described the marked absorption of the bone graft in the two months following implantation and the complete redeposition of bone at about six months.

Karl-Erik Nordin, an orthodontist, and Bengt Johanson, a plastic surgeon, began the Swedish bone grafting in Stockholm on the initiative of Nordin. They began with the secondary cases where a primary repair of the cleft palate had been performed between the ages of one and a half to two years. Johanson did not bone graft until the orthodontist had accomplished a normal bite relationship. The maxillary orthopedics was accomplished by the use of anterior dental braces with springs worn night and day. The expansion of the lateral maxillary segments was accomplished with an expanding screw apparatus. The lateral bite correction was accomplished by intermaxillary wire fixation using orthodontic bands. Johanson originally used iliac crest as the donor site in older patients and implanted his bone graft through the surgically divided lip performing a scar revision of the cleft lip at the same time. However, Johanson now uses tibia for the grafting of primary cases and, at least for a time, was

performing this in infants three to nine months of age. When doing this, he would fill the entire hard palate and alveolar process with bone, using almost the entire substance of the tibia. In these primary cases, he would operate through the unrepaired cleft lip and has often made the comment that once the maxillary cleft is properly filled with bone, the cleft lip repair becomes a simple matter regardless of the technique employed. Johanson has noted no deformity of the leg following regeneration of the tibia nor has he noted any discrepancy in the length of the legs. The use of this donor site has led Johanson to a separate area of research in the field of bone regeneration.

Professor Tord Skoog in Uppsala has bone grafted the anterior maxillary cleft only. He uses split rib in the secondary, previously repaired, cases where the dental occlusion and facial contour is poor. Skoog waits until the orthodontist has established a good occlusal relationship before bone grafting. He has utilized the 'suck and bite' plate in his primary cases in infants. He operates through the upper buccal sulcus without dividing the previously repaired cleft lip and prepares the soft tissue pocket at the time of bone implantation. The age of his patients for such a procedure has varied widely and is determined mostly by when the orthodontist can achieve the best occlusal relationship. Skoog has regrafted several cases following the resorption of the first bone graft and feels that this resorption is often caused by the enzymes emitted from a budding tooth in the area.

In conclusion the greatest stimulus to accomplish these bone grafting procedures has been by the plastic surgeons, who ultimately seem to have to take the responsibility for the appearance as well as the functional rehabilitation of these patients. I was impressed by the enthusiasm of those clinic staffs which were engaged in this philosophy of treatment to standardize indications, and to modify and improve their techniques. There seemed to be no question of acceptance of the principle of bone grafting palatal defects. I was further impressed, by my observations in Sweden, that many of the obvious stigmata of cleft palate patients so commonly seen in nearly all cleft palate clinics were noticeable by their absence.

Finally, much about the indications for bone grafting and the optimal ages for the orthodontic treatment and the surgical procedure is still in question. However, I feel that the procedure is a practical one, based on the sound principal that missing functional tissue should be replaced whenever possible by the same autogenous tissue, and that it has had an adequate clinical trial albeit without certain measurements.

*3200 Dempster
Des Plaines, Illinois*