

## BONE GRAFTING IN SHAFT FRACTURES OF THE LONG TUBULAR BONES

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The problem of transplantation of tissues and, more particularly, of bone tissue has long since challenged surgeons and traumatologists. The issue became particularly pressing in the past 15—20 years and was recognized as a routine method of treatment mainly in operative orthopedics and traumatology.

Along with the transplantation of bone autografts, conditions were also created for the use of bone homografts available from the bone bank with the Emergency Institute «Pirogov» in Sofia. The bone transplants used are from lyophilized bone. Owing to technical reasons and shorter terms of validity we did not employ frozen bones, which, in the opinion of many authors, have superior plasticity properties than lyophilized bone (10, 12).

This method of treatment is not new, dating back in ancient Hindu history, but actually it has received recognition and wide application. This has been made possible by the great achievements of medicine, physics, chemistry and technology over the past two decades.

Two basic methods of bone grafting are distinguished — auto- and homoplasty. The possibilities of survival of the transplant are naturally much greater in autoplasty (8, 9, 10, 13, 16, 22).

Of course, there are authors such as Herber, supporting a different viewpoint, namely, that homo- and autografting have equal chances of success, and therefore, he assumes that it would be erroneous to resort to autoplasty (2, 16). A similar tendency is outlined in this country too, being imposed on the ground of two reasons mainly: firstly, because of the great possibilities of providing material in terms of quantity and conservation of the same for rather long time (10, 16, 23) and, secondly, because of the patient's preference to homografting procedures. All this contributed greatly for the adoption of bone grafting on a world-wide scale.

A third group of authors advocate the combined bone grafting: auto- and homoplasty simultaneously. These authors claim that such a method is more reliable (10, 22).

The fourth group of authors recommend metal osteosynthesis with extramedullary bone homograft (15, 22) application.

The success of osteoplasty depends on a number of conditions, and on the first place, on the age of donor and recipient, since with aging most of the vital functions slowly die away. In younger donors, the successful outcome is more frequently met, provided the recipient is not older than 50 years.

Furthermore, when bone homograft is employed as donor even from 5—7-month embryo, it shows great regenerative possibilities and very good immunologic tolerance (17).

On the second place, the success depends upon the sound fixation of the transplant and reliable immobilization, with take up, according to some authors, taking place within the same terms of the bone fragments' union (10, 15, 18, 22).

Over the period 1966—1968, in our clinic osteoplastic interventions were performed on a series of 38 patients. Of them 7 with bone autograft, 2 combined (auto- and homograft), 6 osteosyntheses with bone and 23 — only bone homograft. In three of the patients, the bone grafting was carried out after the method of Chaklin (intra and extramedullary). Of the total number, 32 were males and 6 females.

According to age, our case material is distributed in the following manner:

Age	No of patients
0—2 years	4
20—30 "	9
30—40 "	8
40—50 "	6
above 50 "	11

The number of followed-up patients amounts to 30. In 4 of the patients, the osteoplasty at the check-up examination showed a complication with osteomyelitis, in one case with autograft, and in three — with bone homografts. In two of the operated patients, the final outcome was resorption of the transplant with pseudarthrosis ensuing. Expressed in percentuals, these cases amount to 16.7

per cent. Similar results are reported by a number of authors, e. g. 11%, 14%, 14.6% (14, 19, 20). In the remainder (24 patients) the take of the bone graft was complete with no complications whatsoever. In two cases suppuration of the soft tissues occurred, duely controlled with the aid of antibiotics, and thus the development of osteomyelitis was checked. Similar results have been described by other authors too (24). In one case synostosis occurred between the radius and ulna in the position of pronation, and in two other patients — deformity of the crural bone because of early waightbearing of the limb and inadequate immobilization. In two of the patients in whom the osteoplastic procedure was complicated with osteomyelitis, the grafting was effected over purulent terrain. One of them has undergone threefold operation, exhibiting a chronic osteomyelitis with periodic exacerbations. In the same patient, any way, consolidation of the fragments was attained. Such a policy, should naturally be accepted as mistaken, since success in bone transplantation over an infected bed might be anticipated only when cancellous bone is being grafted (3, 8, 26, 27).

For the purpose of osteoplasty, we employed large bone grafts measuring 12—18 cm, almost exclusively applied extramedullary. We never employed the method, recommended by some authors as very successful, of several or numerous thin bone grafts in the form of a «bundle of thin sticks» (10, 11). Out of the total number of 30 patients checked up, the transplant took completely in 28. In 22 of the patients with good take of the grafting, the transplant was completely or almost completely resolved, and in 6 patients it is still in the process of transformation with fully united fragments. The minimum term required for the absorption of the transplant amounts

to one and a half years, whereas the maximal term is two and one half years. In the opinion of various authors, this term is 2 to 3 years (10, 25).

Table 2 illustrates the above term in our series, according to localizations:

The interpretation of the results shows that in our series, the optimal outcome was recorded in bone grafting operations of the forearm. Out of 12 patients, pseudarthrosis occurred only in one. In the remainder, the outcome was very good. Our results concerning the forearm are not in line with those reported by other writers who claim

Site	Grafting term	No of operated cases
humerus	2 y.	6 patients
Forearm	1 y. 10 m.	12 "
Thigh	2 y.	2 "
Leg	2 y. 2 m.	10 "

that the results in the forearm are not as good as in the other tubular bones (17, 19). Of 10 osteoplastic operations on the leg bones, complete consolidation was obtained in the total number, with osteomyelitic process developing in three of them. In 6 patients with fracture of the humerus, one of the osteoplastic interventions resulted in pseudarthrosis. In two of the cases, subjected to operation on the femur, consolidation was the final outcome, although with soft tissues' suppuration in one of them, promptly controlled with antibiotics.

Out of 30 patients undergoing bone grafting, 8 were with pseudarthrosis, 12 with delayed consolidation and 10 — with fresh fractures and bone defects.

Bone grafting proves to be an encouraging method of treatment, mainly of false joints and fractures with delayed consolidation. In the latter condition, in our opinion, it is the treatment of choice. It might be successfully applied also in the management of fresh fractures with bone defect or fractures involving areas considered as predilection sites of pseudarthrosis, as well as for supplementing intramedullary osteosynthesis in case of poor adaptation of the bone fragments. As a matter of fact, it appears to be a prophylactical means against pseudarthrosis. In fresh, well reduced and firmly fixed fractures, bone grafting should not be resorted to; its application in such cases represents exaggeration and prolongs the term of full consolidation, and as a consequence, also the term of temporary working disability.

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## ОСТЕОПЛАСТИКА ПРИ ДИАФИЗАРНЫХ ФРАКТУРАХ ДЛИННЫХ ТРУБЧАТЫХ КОСТЕЙ

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### РЕЗЮМЕ

В статье приводятся результаты 30 остеопластик. Из них 28 полностью прижились, а 2 перешли в псевдоартроз. У четырех больных развился остеомиелит, но несмотря на это консолидация фрактур не наблюдалась.

Остеопластика является ценным методом при лечении псевдоартрозов, затянувшихся консолидациях и переломах с дефектами кости. В пер-вых двух случаях она является методом предпочтения.

При свежих переломах, хорошо репонированных, предпочтение этого метода следует считать необоснованным увлечением, т. к. удлинится срок консолидации и нетрудоспособности.