

UTILITY OF BONE CEMENT FOR FRONTAL BONY CONTOUR DEFORMITY

(Received 11 November, 1991)

L.Baş, M.D. * / A.Numanoğlu, M.D. ** / I.El Hayderi, M.D.*
/ A.Uzunismail, M.D. ******

* *Professor, Department of Plastic and Reconstructive Surgery, GATA Haydarpaşa Teaching Hospital, İstanbul, Turkey.*

** *Associate Professor, Department of Plastic and Reconstructive Surgery, Marmara University, Faculty of Medicine, İstanbul, Turkey.*

*** *Associate Professor, Liege University Medical School, Belgium.*

**** *Assistant Professor, Department of Plastic and Reconstructive Surgery, GATA Haydarpaşa Teaching Hospital, İstanbul, Turkey.*

SUMMARY

In our department, in 2 male patients having frontal bony depression due to motor vehicle accident "Methyl Methacrylate", known as Bone Cement was utilized to correct the contour deformity.

In both cases, the cement was applied as onlay after being shaped, on the deformity.

Any problem related to early and late postoperative period has not been seen in the 1 year follow up period. Our experience and 2 illustrative cases are presented.

Key words: Bone Cement, Methyl Methacrylate, Onlay

INTRODUCTION

The surgical use of inorganic materials as bone substitute is not a new procedure. This kind of alloplastic implant has been found to be versatile in various disciplines of plastic surgery, particularly in craniofacial one (1).

However, the materials can be rejected by the organism. Any infection in recipient site, lack of a good soft tissue coverage on the implant have caused their limited usage. Hence, satisfactory results can be achieved when they have been used as onlay in only selected cases such as cranial or facial bony contour deformity (2).

Traditionally, the fresh otogenous tissue has been stated to be the ideal substitute for correction of bony deformity, and iliac bone and costal grafts have been used widely in bony reconstruction (3). However they

are not free of some disadvantages and there are certain limitations in practice (Table I).

TABLE I : DISADVANTAGES OF AUTOGENOUS BONE USE

- Restricted availability of donor tissue,
- Additional surgery, required for harvesting the autogenous graft
- Donor site morbidity
- Additional operative time
- Difficulties in shaping of the graft to conform the defect
- Possible resorption of the graft
- Displacing of the graft

This is why the alloplastic materials were demanded to be able to cover the operation in one session. Various inorganic implants such as Acrylic Polymers, Silicon Rubber, Proplast (Grafite+Polytetrafluor Ethylene), Bioabsorbable Ceramic have been utilized for the purpose, however a lot of problems have been encountered, such as tissue reaction, extrusion and degradation of the implant, etc (4).

The ideal material for bone substitute should have the following properties. It should.;

- be strong and lasting
- be inert
- be easily moulded and carved
- be fabricated and implanted in one operative session

Additionally, low thermal conductivity and radiolucency

are the other desired properties, enhancing the quality of the material. In the developing countries, the cost of the material namely, being rather cheap is another factor, affecting the selection of the implants to be used as bone substitute.

To our knowledge, there are two different alloplastic implants, nearly sufficient to fulfill the desired properties; One of them, "Silicon Rubber" has been used widely for a long time. The other one is "Methyl Metacrylate" known as "Bone Cement". The latter is significantly cheaper.

MATERIALS AND METHODS

In our department, between 1989-90, in two male patients, we used the methyl metacrylate as bone substitute.

Properties of Methyl Methacrylate:

Methyl Metacrylate is available in two forms, either thermally (hot-cure) or chemically (cold-cure) activated. In the latter form which is widely used, liquid monomer is mixed with the powdered polymer in the ratio of 2:1. A plastic dough is formed since polymer granules are held together by newly polymerised monomer. A considerable amount of heat is generated during the polymerisation process and a sterile plastic paste forms, getting hard in a few minutes. The methyl metacrylate, formed in that way is a clear, rigid and relatively strong material.

Advantages: Methyl Metacrylate

- can be carved, shaped,
- burr holes can be created as demanded to conform and to keep the implant in place
- is light
- does not protrude
- does not cause infection
- is rather cheap

Disadvantages:

- The soft tissue can be damaged by the excess heat, over 70 °C, generated during the polymerisation process so the tissues must be protected by wet sponges and continuous irrigation with saline.
- It can induce hypotension during application, the anesthesiologist should be warned beforehand
- It can be distorted or twisted, for a good fixation, creating some burr holes in the edges of the defect may be demanded.
- Rarely degradation or breaking may be seen in the long term period.

RESULTS

This study includes 2 cases of the frontal bony deformity composed of moderate depression due to traffic accident. They were 20 and 28 years old. Any systemic reaction or soft tissue damage have not been observed during the polymerization period. The patients have done well postoperatively. The follow up period was one year. In the period any history of infection, secondary deformity because of the resolution or retrusion of the implant have not been observed.

DISCUSSION

The Methyl Metacrylate (Bone Cement) has been used primarily to keep the joint prosthesis fixed in particularly the long bones. However, the implant has been utilized as biomaterial in dental practice to make dentures, crown, bridge and in prosthetic field as manufacturing artificial eye, nose and ear since 1940 s (4).

Methyl metarylate, has been used in reconstruction of facial and cranial bones after the Second World War. Although the first application was for craniofacial reconstruction by Zander, a general surgeon in Germany, the first report was done by Dickinson in 1952. The material, reported to be used sporadically in 1940s, has been utilized particularly by neurosurgeons routinely for approximately 30 years (1).

It has been suggested that alloplastic material has no place in reconstructive craniofacial surgery, by Munson and Heron. Although the first choice may be the autogenous bone graft, the alloplastic material, fulfilling the desired criteria has always a place to be used e.g., utilizing as onlay in a selected case as depressed cranial or facial bone.

However, absolute contraindications in the cases where the defect is very close to the nose and paranasal sinuses, the infection risk is high or sufficient soft tissue for coverage is missing, have always existed (5).

In the craniofacial reconstruction, other alloplastic materials, fulfilling the desired criteria than methyl metacrylate have been used to correct the contour deformities. For example, Silicon Rubber has been used in late 1950s. The implant, having high extrusion rate and expensive cost still has been used nowadays (4). Proplast is another material, used for correction of bony contour deformities. Although it is easy to shape, there are some practical problems, involving irregularities and feathering of the edges afterwards. Microscopically, surface fragmentation has been shown, as well (6).

Apart from above mentioned implants, the Methyl Metacrylate, actually an acrylic resin has been found more advantageous when used as a bone substitute in craniofacial reconstruction. Besides being strong, easy to manipulate, it is noncarcinogenic and radiolucent. Radiopaque substance may be added in order to be able to observe radiologically in postoperative period. It has similar density to bone and low electrical conductivity. It is well tolerated by soft tissue bone and even duramater. Any new bone formation, sclerosis or resorption of adjacent bone or of the cement itself have not been reported with the use of Methyl Metacrylate (7). However, a tissue reaction, composed of foreign body giant cells besides a fine fibrous connective tissue layer has been shown (2).

Several disadvantages of methyl metacrylate use have been reported. A severe systemic hypotension, during polymerisation processing can be seen. Thus, the anesthesiologist should be warned. Actually this problem which has been reported by orthopaedic surgeons has not been seen in facial or skull bone reconstruction. This may be because of the small amount of material, used (5). We have not seen it in our patients.

Another disadvantage is that the methyl metacrylate produces excess heat, peaking over 70°C, during polymerisation processing since it is an exothermic substance. When used intraoperatively, the surrounding tissues must be preserved by wet sponges and continuous saline irrigation.

As a late major problem, mechanical insufficiency involved in breakage or degradation of the implant at the touching part to the bone has been reported but we have not seen this problem in our cases.

We have not seen any infection or protrusion that have been accepted as main problems in alloplastic material use. The finding was correlated with the ones, in references.

We conclude that methyl metacrylate has been found to be worthy to use as a bone substitute in selected cases of bony contour deformities, involving particularly craniofacial ones, considering the difficulties with autogenous tissue transfer (Table I) and rather low cost rate, easy application and other advantages of methyl metacrylate.



FIG.1-A : Left frontal bony contour deformity due to motor vehicle accident, front.

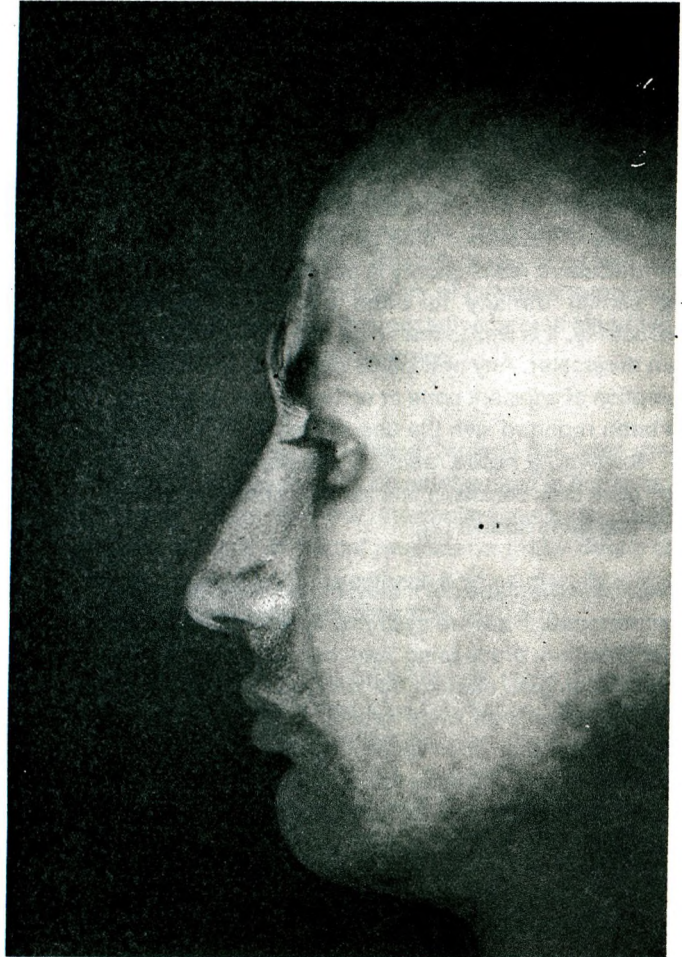


FIG.1-B : The same patient, side



FIG.1-C : Exposure through bicoronal incision

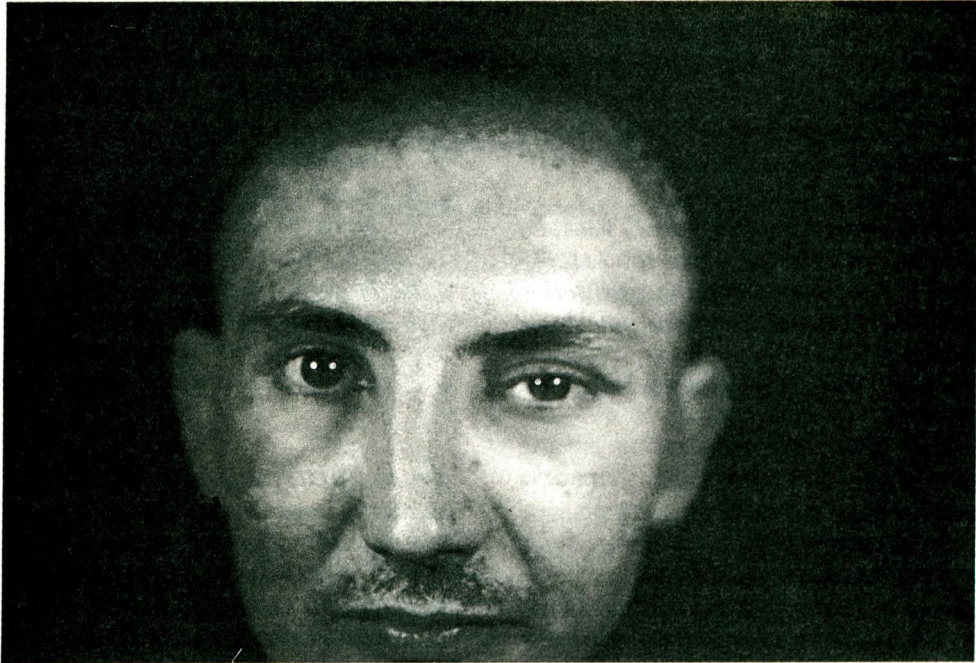


FIG.1-D : Postoperative appearance, early period, front



FIG.1-E : Postoperative appearance early period, side

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