

RABBIT SNOUT GROWTH
RELATIONSHIP AFTER SURGICAL EXPERIMENTATION
IN THE SEPTOVOMERAL REGION

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Preface

Research in the basic sciences of medicine or surgery is time consuming and expensive. Disappointments and other frustrating events that occur must be expected. However, these undesirable side effects are occasionally neutralized by meaningful contributory results.

One must be motivated to the extent that he is willing to make the necessary sacrifices inherent in pursuing the project that has been presented.

I met Dr. Maurice Cottle approximately twelve years ago. He proved to be the friend and teacher that I had been seeking throughout my medical career. His unselfish devotion to his profession and his overwhelming knowledge aside from the field of medicine, in music, art, literature and philosophy combined have made him the most outstanding teacher of our time. To be associated with him in any degree is not only a privilege but also a great honor.

He has provided me with the impetus inspiration and desire. As a result I was motivated to initiate a project in regard to the effect of nasal injury upon the growth of facial bones in young rabbits.

It was our hope that information obtained through these experiments would be helpful in understanding the effects of nasal injury in young children.

Introduction

A series of five experiments have been completed and are published elsewhere in collaboration with Doctor Bernard G. Sarnat.

These are:

- 1) Rabbit Snout Growth, Effect of Injury to Septovomerale Region (1)
- 2) Rabbit Snout Growth, After Dislocation of Nasal Septum (2)
- 3) Growth of the Face and Jaws After Resection of the Septal Cartilage in Rabbits (3)
- 4) Rabbit Snout Growth, After Resection of Central Linear Segments of Nasal Septal Cartilage (4)
- 5) The Snout After Resection of Nasal Septum in Adult Rabbits (5).

Methods and materials

Animals. Young growing rabbits varying in ages from 29 to 48 days were

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used. Rabbits were selected because of the snout and its rapid rate of growth and because of the anatomical structure of the septovomer joint. Five separate series of experiments were carried out in which 134 rabbits were used. 90 were operated upon, 29 were unoperated on controls and 15 were operated upon controls, where only the approach to the septum was employed but no removal of cartilage or injury to the septovomer joint was done.

Anesthesia. The anesthesia employed primarily was the injection of 1% procaine hydrochloride in the sulcus between the upper incisors and lip. This provided adequate anesthesia and hemostasis.

Surgical procedure. The animals were secured on an operating board in the supine position. The face and snout were cleansed with an antiseptic solution. After injection of the local anesthetic agent sublabially, a transverse incision approximately 1.5 to 2 cm., was made through the mucosa between the upper incisors and the lip. The tissues were elevated from the premaxilla and entrance was gained into the nasal cavity. At this point the caudal margin of the septum and the septovomer joint were exposed.

In our series of experiments the septum was always exposed in this manner. Varying amounts of the septum and septovomer joint were removed from the extreme removal of the septum and vomer to merely dislocate the septum without removal of tissue. Between these extremes, selected portions of cartilage alone were removed. A group of adult rabbits were also operated upon in which extensive removal of the septum was carried out.

Findings

The gross findings in the snouts of the operated animals are given in detail in the publications mentioned. In general, the degree of change and extent of the deformity of the snout varied directly with the amount of removal of septal cartilage and the length of postoperative survival.

In growing young rabbits, extensive removal of the septal cartilage produced extreme and rather bizarre changes in the nasal bones, mandible and teeth (1), (3). No external changes were noted when the septum was merely dislocated (2). Selective linear segment removal of septal cartilage produced interesting localized changes in the nasal bones directly above the area of resected cartilage (4). Extensive resection of septal cartilage in the adult rabbit produced no visible changes in the snout (5).

DISCUSSION

In general the deformities noted in the operated upon rabbits varied almost directly to the degree of injury inflicted.

When the continuity of the septum was disturbed the deformities were noted, and of interest to me was the group of animals in which dislocation of the septum alone did not result in gross changes of the snout, but there was a definite septal deviation which in my opinion would have resulted in impaired nasal respiration of the side of the deflection.

Dr. Cottle's concept of septal totality can be applied to animals just as it is in the human nose. A septum that is in position in the groove of the vomer, and remains intact to the nasal dorsum is considered to be totally intact. When the septal cartilage has been fractured in a horizontal direction or has

been severed surgically by an incision or a portion of the cartilage has been removed so that the septum no longer is in continuity from the vomer to dorsum, this septum is considered to have a disturbance of its totality. We have observed this in many cases in which serious injury to the nose in childhood resulting in fracture or dislocation of the septal cartilage has resulted in marked nasal deformity and particularly in marked difference in the projection of the external nose.

Removal of septal cartilage in the young growing rabbits produced changes in the nasal bones and surrounding structures and may be observed very early, in some instances as early as 14 days postoperatively.

In view of these findings it is suggested that further injury to the area of the septovomer joint and body of the septum be avoided as far as possible. One is mindful of the fact that an injury sufficient to produce a severe deviation of the nasal septum in a child may also have disturbed the vital growth centers. The policy that I have adopted in these instances is to attempt to rearrange the structures as carefully as possible with minimal additional injury to the tissues particularly in the septovomer joint region. When an adequate airway is provided this may be considered as the completion of the first stage of a probable multiple procedure operation. Secondary procedures are then carried out as indicated until the final desired result is obtained. Deviation of the nasal septum frequently is encountered in the region of the attic, the area of the nasal cavity directly below the nasal bones. This space normally is void of important structures but injuries to the nose may produce an obstruction, or at least aberrations of the air currents which can effect normal nasal physiology.

Extensive removal of the nasal septum in the adult rabbit produced no change in the nasal bones. In view of this experiment it is my impression that the structures directly below the nasal bones may be removed as extensively as is necessary without danger of collapse or deformity of the bony nasal pyramid.

Recently a young boy 7 years of age was seen in which the external nose projected only a few mm. above the maxilla. At surgery the anterior cartilaginous portion of his septum was absent, the premaxillary wings were absent. Posteriorly, two septa were found, one fairly thick and the second thin and irregular suggesting the presence of a paraseptal cartilage which failed to absorb. Externally, the nasal bones could not be palpated, and the nasal processes of the maxilla were rudimentary. The columella was short and the upper lateral cartilages were extremely thin and ballooned. These findings were to be expected because of the absence of the body of the septal cartilage, and are, consistent with an injury during the prenatal period. The lobule cartilages were normal.

No intent to compare results of injury in the young child to those of a young growing rabbit, is implied. Yet basic principles applied to changes of structures surrounding the nasal septum in young growing animals must be considered, and certainly more knowledge of the exact location of primary growth centers, and information regarding the effect of injury to these centers must be obtained.

SUMMARY AND CONCLUSIONS

1. A series of experiments on young growing rabbits have been performed in which varying degrees of injury was inflicted in the region of the nasal septal cartilage and septovomer joint.
2. The sublial approach to the caudal margin of the septal cartilage and septovomer joint was employed, and under local anesthesia varying amounts of septal cartilage and vomer were removed.
3. In the animals in which minimal trauma was applied, dislocation of septal cartilage, no gross external changes were noted.
4. When extensive amounts of septal cartilage alone or with portions of the vomer were removed, extensive changes in the snout were demonstrated. The most outstanding changes consisted of a shorter, broader snout, with downward angulation of the nasal bones. The incisors were not in occlusion and overerupted.
5. In the group of animals in which selected portions of nasal septal cartilage only were removed, changes in the snout consisted of downward deflection, in an anterior direction, of the nasal bones, a shorter snout, and a definite dip in the nasal bones corresponding to the location of the excised septal cartilage.
6. Surgical removal of an extensive amount of septal cartilage in the adult animal resulted in no gross external deformity of the snout or adjacent structures.
7. The case of a 7 years old boy who presented unusual findings at surgery suggested an injury to the nose probably in the prenatal period was cited.
8. Totality of the nasal septum when disrupted demonstrates changes in the rabbit septum which may be similar to the changes in the human septum in those instances where totality of the septum has been disturbed.
9. Surgical extirpation of septum structures in the region of the attic of the adult can be removed without danger of collapse or depression of the external nasal pyramid.
10. Although precise analogies cannot be made between rabbits and human, in view of the findings in these experiments it would be advisable that young children who have sustained injuries to the anterior portion of the nose be observed in the ensuing years, not only for the immediate or late nasal deformities, but also for related deformities of the teeth, face and jaws.
11. Perhaps, these and future experiments may help provide additional information on this important subject.

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