Conservative reduction of large periapical lesions

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The clinician is often confronted with the problem of treating an extensive periapical lesion which may be cystic as a result of pulpal pathosis. Surgical management by curettement and/or apical resection has usually been the accepted procedure for such lesions. However, in cases in which extensive periapical lesions are visualized on the roentgenograms, a surgical approach can create complications by injuring the vitality of the adjacent teeth and may possibly cause an anatomic deformity.

The purpose of this article is (1) to question the need for surgical treatment of the extensive periapical lesion and (2) to present a method of treating the lesion with minimal surgical intervention and injury to any of the related structures in cases of extensive regions of rarefaction.

FREQUENCY OF RADICULAR CYSTS

Studies of periapical lesions associated with nonvital teeth have demonstrated that it is not possible to diagnose a radicular cyst by roentgenographic evidence alone. Moreover, it has also been observed that the size of a periapical lesion is not a criterion of a cyst. Small roentgenographic periapical lesions are often cystic, and some large areas may not be. Histologic observations have confirmed that many small periapical lesions can be cystic, whereas large lesions may be granulomas. Therefore, the size of a roentgenographic lesion is no diagnostic criterion of a radicular cyst.

With respect to the incidence of periapical lesions associated with nonvital teeth, histologic examination has shown that 43 to 54 per cent are actually radicular cysts.[1-5] That roentgenographic evidence has not been consistent with the histologic evidence has tended to disguise the fact that cysts occur with much greater frequency than previously suspected. Since the literature is replete[6] with reports indicating that conventional nonsurgical endodontic therapy has a 70 to 90 per cent radiographic success rate, it becomes evident that cysts can be healed with conservative therapy.

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MARSUPIALIZATION OF LARGE CYSTS

Partsch[7] was one of the first to demonstrate the feasibility of reducing the size of a large cystic lesion by marsupialization, thus preserving much of the surrounding bone structure. Archer,[1] commenting on the advantages of marsupialization, stated that there should be a more general application of the principles of marsupialization in the treatment of large apical lesions. Sommer and associates[8] demonstrated the reduction of a large periapical lesion with the use of a rubber-dam "I" wick by keeping the surgical opening patent. In 1963 I introduced an obturator of self-cured acrylic for the same purpose and found that resolution occurred satisfactorily in an extensive globulomaxillary cyst.

In recent years, I have used polyethylene and polyvinyl tubing to reduce large periapical lesions. This type of tubing is often used in certain cardiovascular procedures and is readily available from medical supply sources. Many different sizes of tubings are available, and the most useful size has been 0.184 inch in diameter. The tubing can be precut to desired lengths and sterilized by autoclaving; the polyethylene tube is sterilized with ethylene oxide.

The procedure is performed under local anesthesia. An incision is made, and the mucoperiosteum is reflected so that enough labial or buccal bone is removed to accommodate the tube. The contents of the lesion are aspirated, and a saline lavage is used to irrigate the area. The sterile tube is inserted into the prepared opening so that it gently contacts the base of the lesion. The end of the tube is contoured to conform to the anatomy of the gingiva, with sufficient length protruding to prevent the tube from slipping below the margin of the opening. The exposed margins of the tube should be smooth to prevent irritation of the soft tissue.

Epithelization of the margins of the surgical window usually takes place within 5 to 7 days. After that time lapse, the area is examined for evidence of irritation from the tube as well as to make certain that the lumen of the tube is patent. In addition, the patient is instructed in the use of a hand syringe to flush out the area of the lesion with a saline solution and also in the method of removal and reinsertion of the tube. The patient is seen at intervals of 2 to 4 weeks for reduction of the length of the polyethylene tube as resolution of the lesion progresses.

ADVANTAGES OF TUBE TECHNIQUE

1. There is no collapse or closure of the surgical window.
2. The tube stays in its original position and does not extrude or creep, as compared to the rubber-dam "I" wick.
3. It is relatively easy to keep clean.
4. It is easier to fit and form than an acrylic obturator.
5. It can be sterilized before use and resterilized if necessary.
6. It is readily tolerated by the patient and is relatively free of discomfort.
7. There is no perceptible irritation to the soft tissues.
8. The length can be altered as healing progresses.
9. It is easily and quickly replaced.

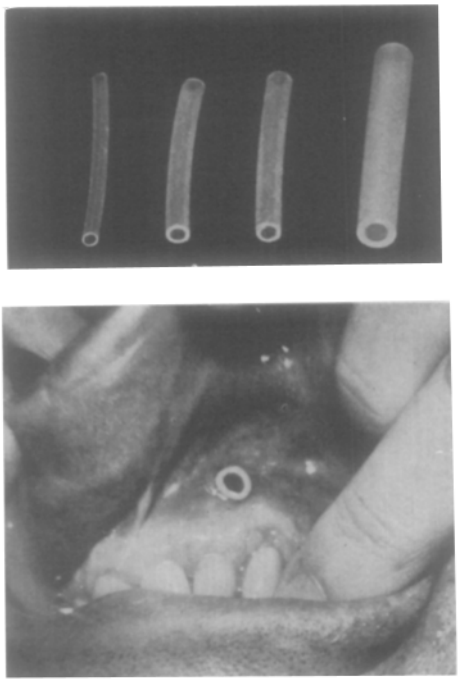


Fig. 1. A, The larger tube is made of polyvinyl chloride; the other of polyethylene. The outside diameters range from 0.082 to 0.184 inch. *B,* Visual appearance of tube in position.

CASE REPORTS

The use of polyethylene or polyvinyl tubes (Fig. 1) is illustrated in the following case reports.

CASE 1

A 27-year-old man was referred for treatment of an acutely painful maxillary lateral incisor. The lip was slightly swollen, and the mucosa over the lateral incisors and canines was distended and painful on compression.

The roentgenogram revealed an extensive region of rarefaction extending from the mesial aspect of the lateral incisor to the anterior wall of the antrum and apically on the interradicular area of the two teeth approaching the alveolar crest with displacement of the roots (Fig. 2).

The patient was apparently in good health, with no significant history or clinical findings other than an unlined silicate restoration in the lateral incisor, which was slightly discolored; the tooth gave no response to the electric pulp tester.

The root canal of the lateral incisor was opened to relieve the acute symptoms, and the patient was instructed to return in 5 days. At this time a surgical window was made, with a curette, in the apical area between the lateral incisor and cuspid roots. Pus and fluid were evacuated and irrigated with saline solution. A rubber-dam "I" wick was inserted for a period of 1 week. The rubber-dam "I" wick was then removed and replaced with a polyethylene tube. After 8 weeks, routine endodontic therapy was initiated. After four successive negative cultures, the canal was filled with a silver cone and a root canal sealer. The tube was retained for 12 weeks and then removed. Healing continued uneventfully until resolution of the lesion was complete.

A *B* *C*

Fig. 2. A, Diagnostic roentgenogram of extensive periapical and interradicular rarefaction between lateral incisor and cuspid teeth. Note displacement of roots. *B,* Seven months following insertion of tube drain and 6 months following completion of endodontic therapy. *C,* Twenty-three months after treatment. Note resolution of rarefaction and repositioning of roots.

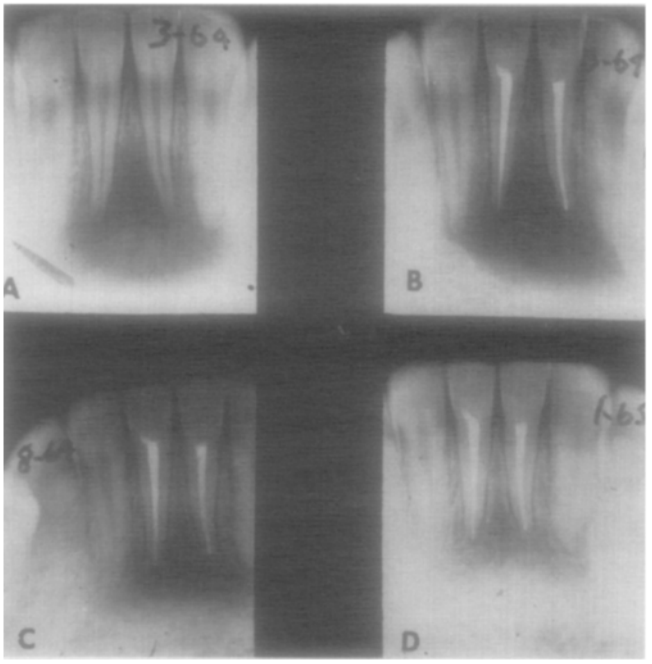
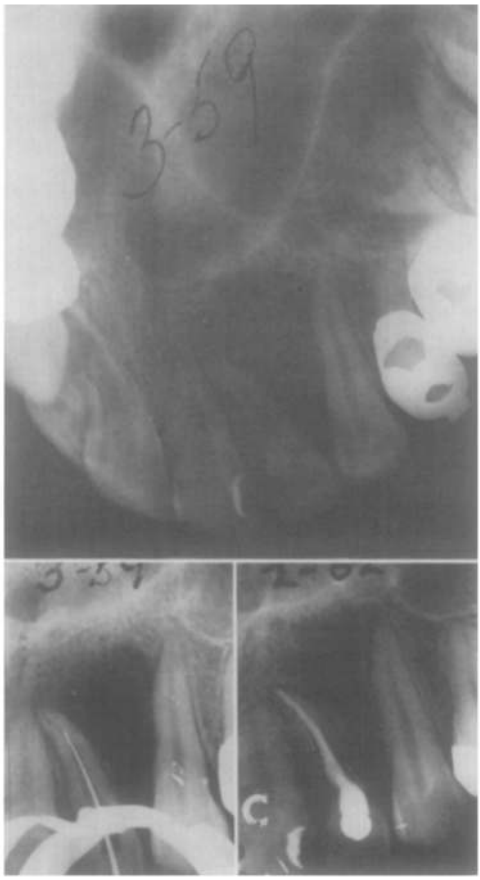


Fig. 3. A, Diagnostic roentgenograms. Note extensive rarefaction and root displacement of central incisors. *B,* Endodontic therapy completed. *C,* Follow-up roentgenograms 5 months after treatment. *D,* Roentgenographic evidence of resolution 10 months after treatment.

CASE 2 (Fig. 3)

A 14-year-old girl was referred with a complaint of swelling and tenderness in the anterior segment of the mandible.

An intraoral examination showed a well-cared-for dentition. The mandibular central incisors were tender to percussion, and the apical region was distended and tender to palpation. The central incisors gave no response to any of the conventional pulp-testing procedures.



A

B

C

Fig. 4. A, Occlusal roentgenogram showing extent of lesion and root displacement of lateral incisor and cuspid teeth. *B,* Intraoral film of lesion. *C,* Thirty-five months following treatment showing resolution and repositioning of lateral incisor and cuspid roots.

The roentgenogram showed an extensive area or rarefaction encompassing the apical half of the incisors. The roots of the two central incisors were displaced.

The patient had recently had a thorough physical examination and was in apparent good health. There was no history of any injury to the teeth or jaw; nor were there any carious lesions in the incisor teeth.

The root canals of the two central incisors were opened. Discharge of a free-flowing exudate followed, with immediate relief of discomfort. The canals were filled after successive negative cultures. The patient was kept under observation for 10 weeks, after which time the tube was discarded. Roentgenographic evidence of resolution was apparent after 3 months. Five months after the initial treatment, the rarefaction was almost completely resolved.

CASE 3 (Fig. 4)

A 13-year-old girl undergoing orthodontic treatment was referred for consultation after she complained of tenderness in the apical region of the maxillary right lateral incisor.

Orthodontic bands were present on the posterior teeth. The anterior bands had been removed the previous day. The soft tissues did not seem to be inflamed, and the mouth appeared to be well cared for. The lateral incisor was slightly tender to percussion, and

compression of the apical region produced no discomfort. The tooth did not respond to pulp-testing procedures.

A routine roentgenogram disclosed an area of rarefaction in the apical and interradicular areas between the lateral incisor and cuspid teeth. The rarefaction extended gingivally to the alveolar crest, and the roots were obviously displaced. A silicate restoration was present on the mesial surface. Apparently, no protective lining had been used on the base of the cavity.

The patient was in good health. Some months previously, during school athletic activities, the girl had suffered an impact injury to the maxilla. There had been a slight contusion of the lip but no indication of any dental injury.

The root canal was opened. The pulp was necrotic, but no drainage was detected. The canal was cleansed, medicated, and sealed. Under local anesthesia, a surgical window was prepared in the central portion of the lesion to receive a rubber-dam "I" wick. One week later the wick was removed and a polyethylene tube was inserted in the opening. The endodontic treatment was carried out routinely in the following 2 weeks. The patient was observed periodically, and resolution continued uneventfully until healing was complete.

CASE 4 (Fig. 5)

A 22-year-old woman was referred for treatment with a complaint of tenderness in the area of the mandibular incisors.

Intraoral examination disclosed elevation of the labial mucosa, which was continuous throughout the labial segment of the mandible. The swelling was hard and tender to compression. The left central incisor and the right lateral incisor were tender to percussion, and neither of these teeth responded to any of the pulp-testing procedures. The remaining teeth were apparently vital. Most of the proximal surfaces had been carious and restored with silicate restorations.

Roentgenographic examination revealed an area of bone loss extending from the mesial aspect of the left cuspid in a wide crescent to the right premolar region. The rarefaction extended on the distal aspect of the left central incisor approaching the alveolar crest. The mandibular right premolars had been removed when the patient was 12 years of age to correct what was supposedly a cystic lesion. No biopsy report had been made.

Fig. 5. A, Diagnostic roentgenogram of lesion. *B,* Occlusal roentgenogram following root canal fillings. *C,* Extent of resolution 6 months following initial treatment.

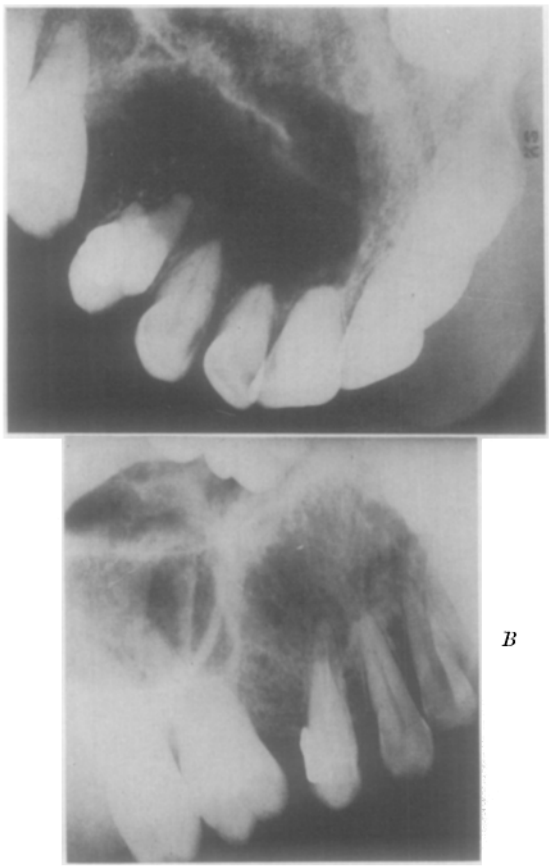
The patient was in supposedly good health.

Although the left central incisor had been opened 3 days earlier by the referring dentist, there had been no relief from the discomfort. The root canal of the left central incisor was renegotiated, with no apparent exudate. The right lateral incisor was then opened. Although no drainage could be detected, the patient soon indicated some relief from pain. Both canals were left open for 7 days, at which time the patient returned for conventional endodontic treatment of the two teeth. Under local anesthesia, a surgical window was prepared subjacent to the left central incisor. Aspiration of pus and fluid from the lesion was followed by placement of a polyvinyl tube. After successive negative cultures, the canals were filled with gutta-percha. The patient was kept under observation. Three months after treatment was initiated, roentgenographic evidence indicated that the major portion of the rarefaction had resolved. In less then 6 months the area was almost completely healed.

CASE 5

A 48-year-old man was referred for treatment of tenderness and swelling in the left maxillary region. A routine intraoral and occlusal roentgenogram indicated an extensive periapical lesion (Fig. 6, *A*).

Intraoral examination revealed a distension of the labial and buccal region extending from the cuspid to the molar. Palpation and compression of the distended region elicited a



A

B

Fig. 6. A, Occlusal roentgenogram showing location and extent of lesion. *B,* Intraoral roentgenogram made 15 months after initial treatment.

complaint of tenderness from the patient. The palatal area was soft and palpable, which indicated loss of underlying bone. The second premolar was absent. The first premolar had drifted distally, and there were obvious diastemas in both proximal areas. The mucous membrane appeared normal, and there were no visible signs of inflammation. All teeth related to the radiographic lesion failed to respond to any of the conventional testing procedures for pulp vitality.

The roentgenogram showed an extensive area of rarefaction, which extended from the midline to the first molar and appeared to consume the major portion of the body of the maxilla with no apparent invasion of the antrum.

Following induction of local anesthesia, an incision was made in the apical region of the cuspid to create a surgical window. The underlying thin labial plate was easily penetrated. A free-flowing sanguinopurulent fluid flowed from the puncture and was followed by small masses of thick, cheesy matter. A lavage of saline solution was used to flush out the area, and a polyvinyl tube was inserted.

The patient was seen the following week, at which time the tube was removed and the area was cleansed with saline solution. The patient was instructed in the removal and insertion of the tube drain and the use of a hand syringe to lavage the area.

The patient experienced only slight discomfort immediately following the incision, and there was no discomfort or inconvenience during the period of healing. The patient was seen weekly for the first month and then was kept under monthly observation to evaluate the progress of resolution.

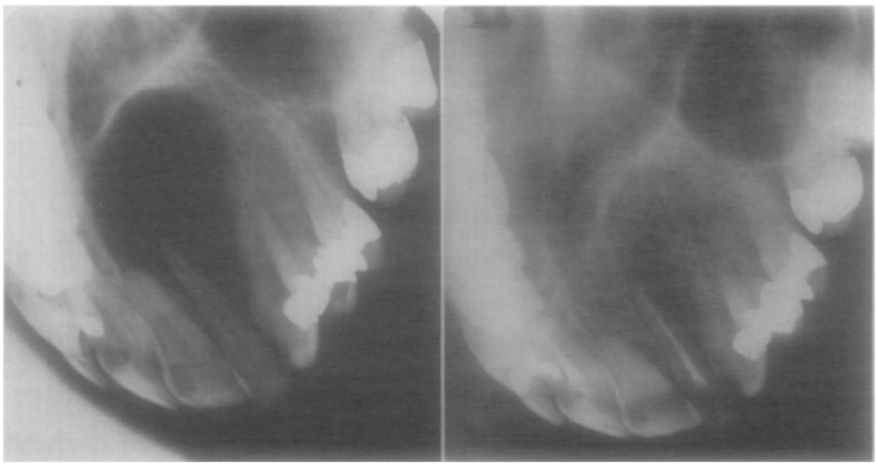
The teeth were tested for vitality subsequent to the insertion of the tube, and evidence of vitality appeared in the adjacent teeth after 3 months. Ten months after treatment was instituted, all teeth gave vital test responses with the exception of the maxillary first premolar. Routine endodontic procedures were instituted and resolution continued uneventfully (Fig. 6, *B*).

The tube was removed 14 months after treatment was initiated. Closure of the surgical window occurred uneventfully.

CASE 6

A 25-year-old man with a complaint of discomfort was referred for treatment of a maxillary pulpless lateral incisor.

An intraoral examination showed a smooth, glistening gingiva with an expanded convex



A *B*

Fig. 7. A, Diagnostic occlusal roentgenogram of location and extent of lesion. *B,* Occlusal roentgenogram made 10 months after treatment was initiated.

labial plate over the apical portion of the lateral incisor and cuspid areas. The lateral incisor had an extensive silicate restoration on the distal surface, extending to and including the incisal angle. Numerous alloy and silicate restorations reflected a high incidence of caries, with evidence of poor home care.

The patient appeared in robust health and had no complaints concerning his general or dental health beyond the immediate issue of discomfort of the incisor in question. There was no recollection of any impact in contact sports during his academic years.

The occlusal roentgenogram (Fig. 7, *A*) demonstrated an extensive radiolucency extending apically to the floor of the nasal fossa and laterally from the midline to the distal apices of the cuspid.

A rubber dam was applied to the lateral incisor and the root canal was negotiated. Upon entry into the canal a free-flowing exudate was immediately apparent, followed by some lacing of blood. Instrumentation and cleansing of the canal were performed and metacresylacetate was sealed in the canal. Following the endodontic therapy, a local anesthetic was administered and a surgical window was created midway of the apices of the lateral incisor and cuspid teeth. A polyvinyl chloride tube was inserted to maintain drainage of the lesion.

The patient returned the following week for culture of the root canal and instruction in the care of the tube and cleansing of the lesion. The canal was filled after a negative culture was obtained.

The patient was instructed to return monthly to have the degree of healing evaluated and to have the tube length reduced to avoid irritation of the labial mucosa. Ten months after treatment was initiated, resolution of the lesion was almost complete as visualized on the roentgenogram (Fig. 7, *B*).

DISCUSSION

All the patients treated in this series exhibited marked resolution of the radiographic lesion without surgical curettement. Since some of these cases may have involved cystic lesions, it is apparent that cysts can heal without extensive surgical curettement. The question can be raised: How is the epithelial tissue removed? Bhaskar[4] is of the opinion that, following endodontic manipulation, an acute inflammation occurs and the polymorphonuclear leukocytes digest the epithelial tissue. This theory can be questioned, however, since polymorphonuclear leukocytes do not digest cells. Bender and associates[10] suggest an interesting hypothesis. They believe that, as healing takes place, collagen is elaborated. The collagen deposition squeezes the capillaries, which shut off the blood supply to the epithelial cells. These cells undergo degeneration and the macrophages remove the disintegrated epithelial cells.

An interesting observation in the present cases is that the cultures remained negative despite the fact that the apical region was exposed to the oral fluids. Four cultures were taken to reduce the possibility of false negatives.

Whether reduction in the size of the lesions could have occurred without drainage and lavage is difficult to equate. However, suffice it to state that a more rapid and efficient method of drainage was obtained through the surgical opening. Drainage of the granulomatous or cystic lesion is essential to initiate healing.

Other questions may also be raised: Is it necessary to maintain the drainage for so long a time? Is it necessary to lavage the area? Perhaps the lavage helps to maintain the patency of the tube with more efficient drainage of the lesion. Furthermore, once periapical drainage is established, why cannot the root canal be treated immediately, with the treatment completed in one or two subsequent

visits? These questions can possibly be answered by modifying the suggested procedures in the future treatment of subsequent cases.

CONCLUSION

In cases of extensive periapical rarefaction, the frequency of cystic lesions has been found to range from 42 to 54 per cent in a survey of the literature. Since it is not possible to make a conclusive diagnosis of such lesions from clinical and roentgenographic examinations, conservative reduction of extensive periapical lesions which may be cystic offers desirable advantages.

A method using polyvinyl or polyethylene tubing has been presented and illustrated with case histories. Polyvinyl tubing has wider application since, unlike polyethylene tubing, it can be sterilized by autoclaving as well as with ethylene oxide.

REFERENCES

1. Archer, H. W.: Oral Surgery, ed. 4, Philadelphia and London, 1966, W. B. Saunders Co., 1157 pp. (400, 402).
2. Priebe, W. A., Lazansky, J. P., and Wuehr-Mann, A. H.: The Value of Roentgenographic Film in the Differential Diagnosis of Periapical Lesions, ORAL SURG. 7: 979-983, 1954.
3. Seltzer, S., Bender, I. B., Smith, J., Freedman, I., and Nazimov, H.: Endodontic Failures: An Analysis Based on Clinical, Roentgenographic, and Histologic Findings, ORAL SURG. 23: 529, 1967.
4. Bhaskar, S. N.: Periapical Lesions—Types, Incidence, and Clinical Features, ORAL SURG. 21: 657-671, 1966.
5. Lalonde, E. R., and Leubke, R. G.: The Frequency and Distribution of Periapical Cysts and Granulomas: An evaluation of 800 Specimens, ORAL SURG. 25: 861-882, 1968.
6. Grossman, L. I.: Endodontic Practice, ed. 6, Philadelphia, 1965, Lea & Febiger, 477 pp. (379-380).
7. Partsch, C.: Bericht der Poliklinik fuer Zagnheilkunde, Leipzig, 1899.
8. Sommer, R. F., Ostrander, F. D., and Crowley, M. C.: Clinical Endodontics, ed. 2, Philadelphia and London, 1961, W. B. Saunders Co., 620 pp. 471-477.
9. Freedland, J. B.: Systemic Considerations in Endodontic Therapy, Internat. Dent. J. 13: 35-37, 1963.
10. Bender, I. B., Seltzer, S., and Soltanoff, W.: Endodontic Success. A Reappraisal of Criteria, ORAL SURG. 22: 780-789; 790-802, 1966.