Comparison of quality of life after surgical endodontic treatment using two techniques: A prospective study

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Objective. The purpose of this prospective study was to compare patient experience of quality of life following surgical endodontic treatment using 2 different techniques: a technique that included the use of a dental operating microscope, root resection with minimal bevel and retrograde preparation with ultrasonic tips, and a traditional technique that included root resection with a 45° bevel and retrograde preparation by bur performed without magnification.
Study design. The study consisted of 66 patients referred for surgical endodontic treatment. One operator (I.T.) carried out all treatment. An equal number of patients were assigned to each group. Group 1 was treated by the traditional technique without an operating microscope and Group 2 by a technique using an operating microscope and minimal osteotomy. All patients were given a questionnaire with 15 questions to evaluate their quality of life for 7 days postsurgery.
Results. On day 5, patients in Group 1 reported significantly more pain and took significantly more analgesics ($P < .05$). On days 1 and 2, patients in Group 2 reported significantly more difficulty in mouth opening, mastication, and the ability to speak ($P < .05$).
Conclusion. Patients in both groups reported a high incidence of symptoms. The technique using the operating microscope provided significantly less postoperative pain, but more difficulties in mouth opening, mastication, and the ability to speak immediately postoperatively.
(Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2005;99:367-71)

Generally, endodontic surgery is required to retain teeth that have persistent periradicular pathosis after conservative root canal treatment. Gutmann and Harrison[1] have summarized the indications for endodontic surgery, which include cases where there is a strong possibility of failure via a nonsurgical approach and/or if there is a failed previous treatment and retreatment is impossible or would not achieve better results. The traditional technique consists of a root-end resection with a lingual to labial bevel for surgical access and visibility and root-end preparation using a round bur, which cuts into the root canal.[2]

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Received for publication Feb 10, 2004; returned for revision Mar 8, 2004; accepted for publication Jun 2, 2004.
Available online 8 October 2004.
1079-2104/$ - see front matter

doi:10.1016/j.tripleo.2004.06.082

In recent years, a technique that includes the use of a dental operating microscope to allow a more precise procedure with minimal bevel of root resection and retrograde canal preparation and filling with the aid of an ultrasonic tip to the depth of 3 to 4 mm has been introduced. This technique is expected to raise the success rate to above 90%.[3,4]

Pain and swelling are common complications following surgical endodontic treatment. Approximately two thirds of the patients treated by the traditional technique require analgesics during the postoperative period.[5,6] Kvist and Reit[7] reported that on the evening after endodontic surgery, almost all patients experienced pain using the traditional technique, with 67% requiring analgesics. Swelling was present in all patients and reached the maximum on postoperative day 1.

The microscopic technique allows the surgeon to assess pathologic changes more precisely and to remove pathologic lesions with far greater precision, thus minimizing tissue damage during the surgery.[8] A low incidence of postoperative pain and swelling following surgical endodontic treatment using a dental operating microscope with measures to control postoperative signs and symptoms have been reported.[9,10]

Other complications, such as hemorrhage or ecchymosis may occur during the postoperative period.[11] Assessment of patient perception of quality of life following dental treatment is a valuable instrument in predicting the postoperative symptoms. Shugars et al[12] applied a health-related quality of life instrument to

evaluate patients' perceptions of their experience after third molar surgery.

The aim of the present study was to compare patients' quality of life after surgical endodontic treatment with the microscope technique, which included the use of a dental operating microscope, root resection with minimal bevel and retrograde preparation with ultrasonic tips, and the traditional technique performed without magnification, root resection with 45° bevel, and retrograde preparation by a bur.

MATERIALS AND METHODS

The study consisted of 66 patients referred for surgical endodontic treatment to the Department of Oral and Maxillofacial Surgery, Sheba Medical Center, during 2001-2002. Informed consent was obtained from all patients participating in the study. Criteria used to perform the surgical endodontic treatment were cases where there was a strong possibility of failure via a nonsurgical approach and/or if there was a previously failed treatment and retreatment was impossible or would not achieve better results. Exclusion criteria were teeth with pathosis associated with vertical root fractures, teeth with coronal perforations, and periodontal pockets >7 mm. Patients who received any analgesics or antibiotics 3 months before treatment were also excluded from the study. Medical history, age, gender and tooth number were recorded for each patient.

The same operator (I.T.) performed all surgical procedures in the morning. The patients were treated by the traditional technique during the first months of 2001 until the dental operating microscope was purchased. Subsequently, all patients were treated by the microscope technique. Informed consent was obtained from all patients participating in the study.

The traditional technique (Group 1) included anesthesia with lidocaine 2% with epinephrine 1:100 000, triangular full mucoperiosteal flap, osteotomy and root-end resection with 45° bevel using a high-speed bur, curettage, retrograde preparation using a low-speed bur root-end filling with intermediate restorative material (IRM) (Caulk Dentsply; Milford, Del), flap reapproximation, and suturing with Vicryl 4/0 (Johnson and Johnson; Somerville, NJ). Sutures were removed after 7 days.

In Group 2, the technique used a dental operating microscope. This technique included anesthesia with lidocaine 2% with epinephrine 1:100 000, triangular full mucoperiosteal flap, osteotomy and root-end resection with minimal or no bevel using a high-speed bur, curettage, retrograde preparation using diamond-coated ultrasonic retro-tips (Satelic; Merignac, France) to a 3-mm depth, root-end filling with IRM (Caulk Dentsply), flap reapproximation, and suturing with Vicryl 4/0 (Johnson and Johnson). Sutures were removed after 7 days.

Time needed to complete each surgical procedure, starting from the first incision to finishing the last suture, was recorded for each technique.

Both groups received the following postoperative instructions: (1) avoid mouth rinsing, hard and hot food, hot drinks, physical activities, and tooth brushing during the day of operation; (2) apply cold compresses on the skin at the site of surgery intermittently every 15 minutes for the remainder of the day; and (3) chlorhexidine 0.2% mouth rinses starting the day after surgery for 7 days. Since pain and/or swelling could appear after the procedure, patients could take over-the-counter analgesics if needed (paracetamol or naproxen sodium). Postoperative instructions were given verbally by the operator as well as in written form. Patients were to contact the surgeon if they experienced severe pain or swelling, or bleeding.

Patient assessment of quality of life following surgical endodontic treatment

Each patient received a questionnaire to fill out for each day starting the day of surgery for 7 days postoperatively. The questionnaire was modified from Shugars et al[12] to evaluate the postoperative patients' limitations (ability to chew and speak, ability to conduct daily activities and sleeping), pain, and other symptoms, including swelling, ecchymosis, bleeding, nausea, bad taste/breath, and food impaction. The questionnaire consisted of 15 questions in which patients were to evaluate their quality of life with the 5-point Likert-type scale, ranging from 1 ("not at all") to 5 ("very much"). The last question referred to whether the patient had taken any analgesic for that postoperative day (Table I).

Statistical analysis

Distribution of patients between the groups according to the site of operation and number of teeth operated on was assessed by Chi-square tests (Pearson Chi-square and Fisher's Exact Test). Age distribution between the groups was assessed by *t* test. Analgesics taken by the patients were evaluated between the groups on each postoperative day by Fisher's Exact Test. Patients' experience of quality of life was evaluated using analysis of variance (ANOVA) with repeated measures.

RESULTS

Three patients (2 in Group 1 and 1 in Group 2) failed to fill out the questionnaire and were not included in the study. Thus, there were 31 patients (17 men and 14 women, ranging in age from 19 to 52 years, average 31.2 years) evaluated in Group 1 and 32 patients (19 men and 13 women, ranging in age from 18 to 59 years, average

Table I. Quality of life questionnaire

Day 1	Not at all	Very little	Some	Quite a bit	Very much
Do you experience any difficulties with mouth opening?	1	2	3	4	5
Do you experience any difficulties with chewing	1	2	3	4	5
Are there any foods that you can't eat now?	1	2	3	4	5
Do you experience any difficulties with speaking?	1	2	3	4	5
Do you experience any difficulties with sleeping?	1	2	3	4	5
Have you missed your work/school?	1	2	3	4	5
Do you experience any difficulties with your daily activities?	1	2	3	4	5
Do you have swelling?	1	2	3	4	5
Do you have bruises?	1	2	3	4	5
Do you have bleeding?	1	2	3	4	5
Do you feel nausea?	1	2	3	4	5
Do you feel a bad taste or breath?	1	2	3	4	5
What is the worst pain that you felt?	1	2	3	4	5
What is the average degree of pain that you felt?	1	2	3	4	5

Did you take any pain-killers today?_____

34.3 years) in Group 2. Eighty-five teeth had surgical endodontic treatment. More than 1 tooth had surgical treatment in 10 patients in Group 1 and 9 patients in Group 2. Teeth treated consisted of maxillary anterior teeth, premolars and first molars, and mandibular premolars and first molars (Table II). Table III shows the distribution according to the periradicular diagnosis.

There were no significant differences found in the distribution of patients according to age, gender, periradicular diagnosis, and site of operation between the 2 groups.

The average time needed to complete the surgical procedure for Group 1 was approximately 20 minutes (range 15 to 35 minutes), and for Group 2, approximately 40 minutes (range 30 to 55 minutes).

There was no significant effect of age or gender on postoperative patient assessment of quality of life.

Table IV presents the patients' experience of quality of life. In Group 2, patients reported significantly more difficulty in mouth opening, mastication, and the ability to speak on days 1 and 2 postoperatively ($P < .05$).

Table II. Distribution of teeth according to site of operation, n (%)

	Technique	
Teeth	Traditional, Group 1	Microscope, Group 2
Maxillary anterior	26 (61.9)	25 (58.1)
Maxillary premolars	10 (23.8)	13 (30.2)
Maxillary first molars	4 (9.5)	2 (4.7)
Mandibular premolars	1 (2.4)	1 (2.3)
Mandibular first molars	1 (2.4)	2 (4.7)
Total	42 (100)	43 (100)

Table III. Distribution of initial diagnosis and treated teeth, n (%)

	Technique	
Initial diagnosis	Traditional, Group 1	Microscope, Group 2
Chronic apical periodontitis	33 (78.6)	31 (72.1)
Chronic abscess	9 (21.4)	12 (27.9)
Total	42 (100)	43 (100)

There was no difference in postoperative swelling between the 2 groups, but there was significantly less pain experience with a faster decrease in pain levels in Group 2 ($P < .01$). Furthermore, patients in Group 2 took significantly fewer analgesics on day 5 (Fig 1).

DISCUSSION

Surgical endodontic treatment is performed on very small anatomic structures usually with limited access. To improve the success of the procedure, the alternate technique, which uses a dental operating microscope and ultrasonic root-end cavity preparation has been proposed.[8]

Most patients are expected to experience some kind of postoperative pain and swelling after surgical endodontic treatment.[5,7] In addition, various complications may follow immediately postsurgery. Shugars et al[12] proposed an instrument to measure patients' perception of their experience after removal of third molar teeth, which consists of a questionnaire to evaluate postoperative signs and symptoms that may influence patients' quality of life. In the present study, a similar instrument was applied to patients undergoing surgical endodontic treatment by the traditional and microscope techniques.

Similar to other studies,[5,10] age, gender, or site of operation had no influence on the postoperative sequel. Preoperative symptoms may have significant influence on pain experience after surgery.[10] In the present study, all patients were asymptomatic before surgery and there

Table IV. Patients' experience of quality of life for both groups (1: not at all—5: very much). See Table I for complete questionnaire

	Day 1	*Day 2*	*Day 3*	*Day 4*	*Day 5*	*Day 6*	*Day 7*
Mouth opening G1	2.9(±1.3)	2.7(±1.1)	2.3(±1.1)	2.1(±1.1)	1.7(±0.8)	1.6(±0.7)	1.4(±0.7)
Mouth opening G2	3.3(±1.3)	3.3(±1.1)	2.5(±1.0)	2.1(±1.0)	1.7(±0.7)	1.4(±0.9)	1.3(±0.6)
Mastication G1	3.7(±1.2)	3.1(±1.2)	2.6(±1.2)	2.1(±1.0)	1.7(±0.9)	1.6(±0.8)	1.4(±0.7)
Mastication G2	4.2(±1.1)	3.3(±1.2)	2.5(±1.2)	2.1(±1.0)	1.6(±0.9)	1.5(±0.1)	1.4(±0.8)
Eating satisfaction G1	3.4(±1.4)	2.8(±1.2)	2.3(±1.1)	2.0(±0.9)	1.6(±0.7)	1.5(±0.5)	1.4(±0.5)
Eating satisfaction G2	3.7(±1.3)	3.1(±1.4)	2.6(±1.3)	1.9(±1.1)	1.6(±0.9)	1.4(±0.9)	1.3(±0.7)
Speech G1	2.7(±1.4)	2.2(±1.1)	1.8(±0.9)	1.7(±0.8)	1.4(±0.6)	1.3(±0.5)	1.1(±0.4)
Speech G2	2.9(±1.0)	2.6(±1.1)	2.2(±1.1)	1.5(±0.7)	1.4(±0.7)	1.3(±0.6)	1.2(±0.5)
Sleeping G1	2.2(±1.4)	2.0(±1.1)	1.8(±1.1)	1.7(±1.1)	1.4(±0.6)	1.3(±0.6)	1.0(±0.0)
Sleeping G2	2.3(±1.0)	1.9(±1.2)	1.6(±1.1)	1.5(±0.8)	1.1(±0.3)	1.1(±0.3)	1.0(±0.0)
Work G1	3.6(±1.5)	3.5(±1.6)	2.8(±1.6)	1.8(±1.4)	1.5(±1.0)	1.3(±0.8)	1.1(±0.2)
Work G2	3.8(±1.7	3.6(±1.7)	3.1(±1.7)	1.7(±1.2)	1.3(±0.9)	1.3(±0.8)	1.1(±0.5)
Daily routine G1	3.5(±1.2)	2.9(±1.3)	2.5(±1.1)	2.2(±1.1)	1.8(±1.0)	1.4(±0.6)	1.3(±0.5)
Daily routine G2	3.2(±1.1)	2.8(±1.2)	2.4(±1.3)	1.9(±1.2)	1.5(±1.0)	1.2(±0.5)	1.1(±0.4)
Swelling G1	3.6(±1.1)	3.9(±0.9)	3.4(±0.9)	2.9(±1.0)	2.3(±0.8)	1.8(±0.8)	1.3(±0.6)
Swelling G2	3.4(±1.2)	4.1(±1.1)	3.6(±1.3)	2.7(±1.2)	2.0(±0.9)	1.5(±0.8)	1.2(±0.4)
Ecchymosis G1	1.4(±0.8)	1.3(±0.6)	1.5(±0.9)	1.5(±1.0)	1.3(±0.8)	1.1(±0.3)	1.1(±0.2)
Ecchymosis G2	1.5(±1.0)	1.6(±1.2)	1.5(±1.1)	1.5(±1.1)	1.3(±0.8)	1.2(±0.6)	1.1(±0.3)
Bleeding G1	2.6(±1.3)	1.6(±1.0)	1.3(±0.6)	1.2(±0.5)	1.2(±0.5)	1.2(±0.4)	1.1(±0.3)
Bleeding G2	2.4(±1.3)	1.7(±1.0)	1.4(±0.7)	1.2(±0.6)	1.2(±0.6)	1.1(±0.5)	1.1(±0.4)
Nausea G1	1.5(±1.0)	1.5(±0.9)	1.2(±0.5)	1.3(±0.8)	1.1(±0.6)	1.1(±0.3)	1.1(±0.2)
Nausea G2	1.5(±0.9)	1.6(±1.1)	1.5(±0.8)	1.1(±0.3)	1.1(±0.2)	1.0(±0.0)	1.0(±0.2)
Bad breath G1	2.7(±1.5)	2.5(±1.2)	2.5(±1.2)	1.9(±1.0)	1.8(±1.0)	1.6(±0.9)	1.4(±0.7)
Bad breath G2	3.1(±1.3)	2.6(±1.3)	2.4(±1.1)	2.2(±1.1)	1.7(±0.8)	1.4(±0.7)	1.4(±0.7)
Maximal pain G1	3.5(±0.9)	3.0(±1.1)	2.7(±1.1)	2.4(±1.0)	2.1(±1.0)	1.9(±1.0)	1.6(±0.8)
Maximal pain G2	3.3(±1.2)	2.6(±1.1)	2.2(±1.0)	1.6(±0.9)	1.3(±0.6)	1.3(±0.5)	1.1(±0.3)
Average pain G1	3.1(±1.0)	2.8(±0.9)	2.5(±0.9)	2.2(±0.8)	1.9(±0.8)	1.9(±0.7)	1.6(±0.7)
Average pain G2	2.9(±1.2)	2.4(±1.0)	2.1(±1.0)	1.5(±0.9)	1.2(±0.5)	1.2(±0.5)	1.1(±0.2)

G1, Group 1; *G2,* Group 2.

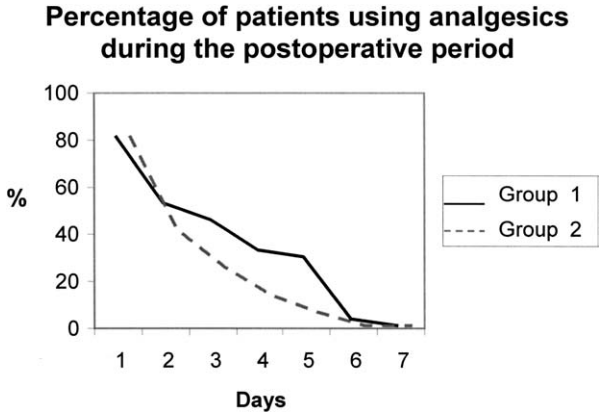

Fig 1. Percentage of patients taking analgesics.

was no correlation between the periapical diagnosis and the postoperative quality of life.

In both groups, all patients reported postoperative symptoms, which were maximal on days 1 to 3 after the procedure, and then generally subsided. All patients reported high values for difficulty with speaking, mouth opening, and mastication, and with daily activity (Table IV). Patients in Group 2 reported significantly more difficulty in mouth opening, mastication, and the ability to speak on days 1 and 2. Generally, the surgical procedure using the microscope technique required more time to complete. Patients have to stay in an uncomfortable position for a much longer time, which causes strain on the masticatory muscles. This may explain the differences in perception for these values during the postoperative period. A modification of the dental chair to facilitate strain on the patients' muscles may be valuable for procedures using a dental operating microscope.

Kvist and Reit[7] report that most of their patients experienced pain and 67% took analgesics after surgical endodontic treatment performed by the traditional technique. Seymour et al,[5] using the traditional technique, found that all patients experienced pain and that the pain was most severe on the day of surgery and that approximately two thirds of the patients self-prescribed an analgesic at some time during the 7-day investigation period. In the present study, all patients reported postoperative pain, but there was significantly less pain experience with a faster decrease in pain levels in Group 2. As well, 81% of the patients took analgesics

on day 1, but by days 6 and 7 almost none took analgesics. Patients in Group 2 took significantly fewer analgesics on day 5 (Fig 1).

Meechan and Blair[6] compared postoperative pain experience after apicoectomy using local anesthesia with lignocaine or etidocaine (long-acting local anesthetic) with the traditional technique and found no differences in pain experience between the groups despite the much longer tissue anesthesia for long-acting etidocaine. They concluded that soft tissues had little effect on postoperative pain experience. Pecora and Andreana[9] compared postoperative pain and swelling for patients treated by the traditional technique with or without the use of a dental operating microscope. They found significantly less postoperative pain in the group treated with the microscope, although there was no statistical difference in swelling. These findings are similar to the present study. The authors[9] propose that this could be due to minimized trauma for tissues, including minimal osteotomy, accuracy in the curettage of the area, and optimized visualization of possible factors that cause the persistence of the pathosis. Less pain experience in the group treated by the microscope technique in the present study may be due to minimal surgical trauma to the hard tissues when the microsurgical precision technique was applied.

All patients reported swelling in both groups. Kvist and Reit[7] did not use any measures to reduce pain or swelling and reported that all patients had swelling after surgical endodontic treatment performed by the traditional technique. According to the surgical protocol used in the present study, it was advisable for patients to apply cold compresses to the skin at the surgery site intermittently every 15 minutes for the remainder of the day. Cold application may help to avoid postsurgical bleeding and reduce postoperative swelling.[8] Tsesis et al[10] analyzed postoperative pain and swelling after surgical endodontic treatment by the microscope technique using a similar surgical protocol, with the addition of premedication with a single dose of oral dexamethasone. Of the patients, 64.7% did not report any swelling and 76.4% were completely pain free. Although direct comparison between these 2 studies is difficult, it can be inferred that influence of cold compresses on postoperative swelling is doubtful and premedication with oral dexamethasone may be the predominant factor for significant reduction of pain and swelling.

In the present study, a high number of patients reported absence from work or school and difficulty with daily routine activities. Kvist and Reit[7] noted that a patient's behavior could be influenced by several factors, such as day of treatment, type of occupation, and design of insurance system.

CONCLUSIONS

A high incidence of symptoms was reported by patients in both groups. Patients treated by the microscope technique had significantly less postoperative pain, but reported more difficulty in mouth opening, mastication, and ability to speak during the immediate postoperative period. Future studies to assess the influence of the operation technique on the long-term success of surgical endodontic treatment are in progress.

The authors thank Professor Amos Buchner for his valuable assistance in the preparation of the manuscript.

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