

## CLINICAL STUDIES ON DIABETES MELLITUS AND DISEASES OF THE ORAL REGION

BY

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### ABSTRACT

Of the 25,672 patients who visited this clinic between January 1964 and March 1973, 126 were diabetic. These were examined statistically and the following results were obtained.

1. Together with diabetes the following disorders pertaining to the realm of oral surgery were observed: Alveolar pyorrhea (49 cases), infection of oral tissues other than periodontal tissues (24 cases), simple periodontitis (15 cases), tumors (13 cases), dental caries (9 cases), neuralgia (6 cases) and several disorders.

2. Of these 126 cases, 85 needed tooth extraction, which was actually performed in 67 cases, with the following results:

(a) Of the 67 cases, 13 developed complications such as dry socket, postoperative infection, sequestrum around the extraction socket, etc. This was a significantly higher incidence than in an equal number of controls.

(b) In the cases with complications convalescence was prolonged to an average of 54.2 days.

(c) In the cases with complications, the preoperative fasting blood sugar level averaged 194.5 mg/dl, which was much higher than in the cases which did not develop complications (average 142.4 mg/dl).

### INTRODUCTION

In recent years, as human life-span increases, the number of people in the age bracket of susceptibility to diabetes has increased<sup>1)</sup> and the number of diabetes cases complicated by diseases of the oral region is also on the increase<sup>1-3)</sup>. Since special treatment must be given to such cases, we made a study of the characteristics of this type of patients among 25,672 who visited our clinic between January 1964 and March 1973.

### CLINICAL STATISTICS

Fig. 1 shows the distribution of oral diseases complicated by diabetes in 126 cases

out of the total and which included alveolar pyorrhea, 49 cases (38.9%); infection of tissues other than periodontal tissues, 24 cases (19.0%); simple periodontitis, 15 cases (11.9%); infection *sensu lato*, 88 cases (69.8%), which were, in order of occurrence, tumors, tooth caries, and neuralgia.

Of the 126 cases examined, as shown in Table 1, 85 cases were judged to require tooth extraction, which was then performed in 67 cases. After the extractions, 13 cases developed some kind of a complication, such as infection, dry socket, etc. The progress of healing in these 13 cases is shown in Fig. 2. For comparison, 67 cases of extraction were selected at random from patients without diabetes, and their healing

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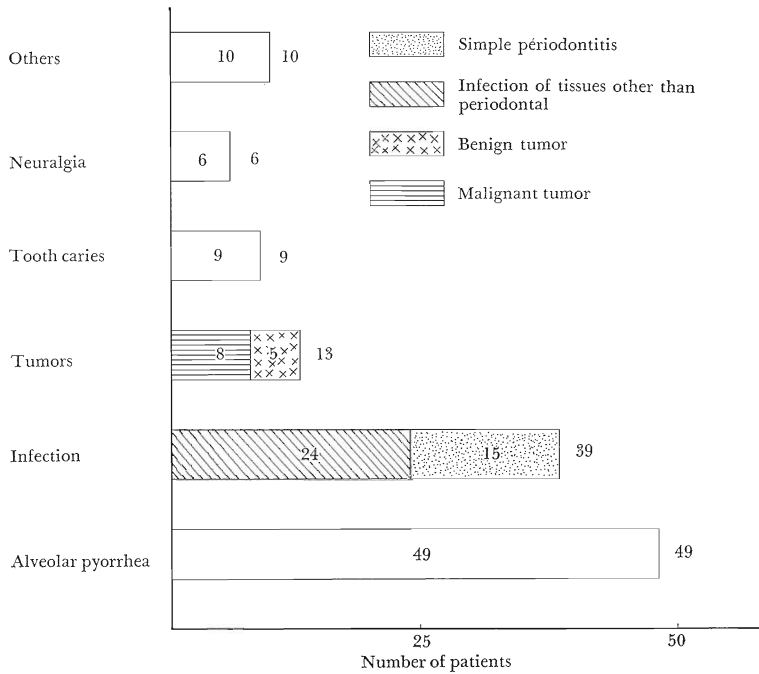


Fig. 1. Distribution of oral diseases complicated by diabetes

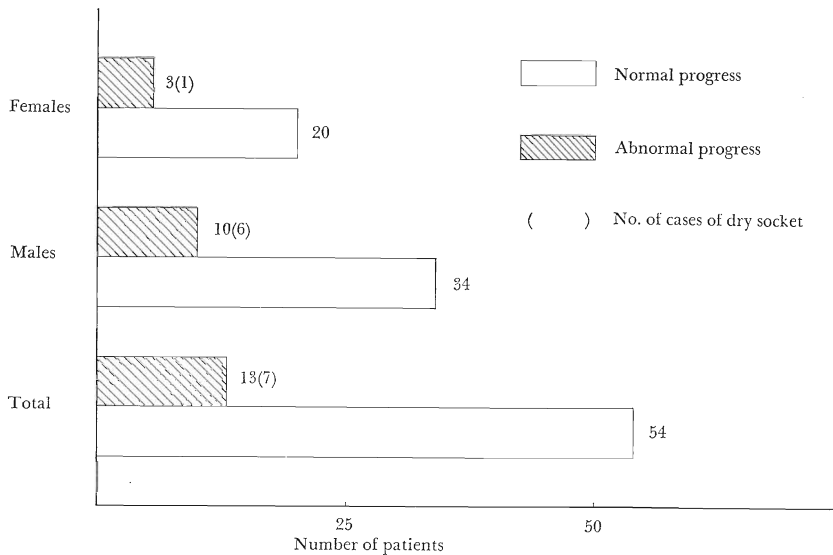


Fig. 2. Progress of healing in the diabetes patients after tooth extraction

progress is shown in Fig. 3. There were only 2 cases (3.0%) of abnormal progress, as compared with 13 cases (19.4%) in diabetic patients. This difference is significant ( $p=0.05$ ). The incidence of dry socket

(10.4%) was also high in diabetic patients compared with the controls (1.5%).

As can be seen from Table 2, in diabetic patients who had teeth extracted, complications appeared at an average of 5.7 days

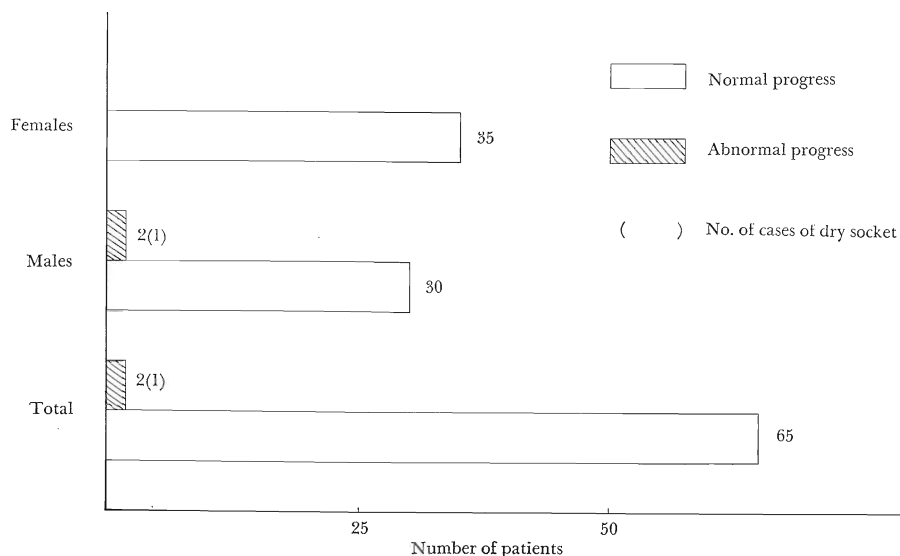


Fig. 3. Progress of healing in the patients without diabetes after tooth extraction

Table 1. Number of tooth extraction

Extracted	Not extracted	Total
67 Cases	18 Cases	85 Cases

Of the 126 cases examined, 85 cases were judged to need tooth extractions, which were then performed in 67 cases.

Table 2. Duration of complications in diabetic patients

Onset of complications	Healing	Duration
5.7±6.6 days	59.9±101.3 days	54.2 days

Table 3. Fasting blood-sugar of diabetic patients before tooth extraction

Patients with normal healing	Patients with complications
142.4±52.0 mg/dl	194.5±49.0 (188.0±39.8) mg/dl

( ) Cases of dry socket

after the extraction, and complete healing required 59.9 days. The duration of the complications was an average of 54.2 days.

Fasting blood-sugar levels of the diabetic patients before tooth extraction are shown in Table 3. Table 4 shows the treatment

Table 4. Treatments given for diabetes both before and after extraction

Treatment	No. of cases	
	Normal healing	Abnormal healing
Insulin+diet	5	4 (2)
Oral hypoglycemic agents +diet	19	3 (3)
Diet	6	
No treatment	9	3 (1)
Unknown	15	3 (1)

( ) Cases of dry socket

given for diabetes, both before and after extraction. As can be seen, the blood-sugar levels were higher (194.5 mg/dl) in patients who developed dry socket and other complications than in patients with normal healing (142.4 mg/dl). In patients so sick that insulin had to be given, complications occurred after extraction in 4 out of 9 cases (44.4%), whereas in cases where diabetes could be controlled by oral hypoglycemic agents, there were complications in only 3 out of 22 cases (13.6%), and there were no complications in cases when diabetes could be controlled simply by diet. In other

words, there was a tendency for complications to appear after extraction in patients with relatively severe diabetes.

There were also 3 cases (25.0%) of complications in diabetic patients who received no treatment for diabetes before and after extraction.

#### DISCUSSION

The complications often seen in diabetes cases are disorders of the eyes, kidney, nerves, and pancreas, and hypertension and arteriosclerosis, skin diseases, infections, gangrene of the toes, and malignant tumors<sup>4-6</sup>). Moreover, from the point of view of the dentist, gingivitis and infection *sensu lato* of the oral region are also often seen<sup>7</sup>). In our study the highest incidence was the infection (69.8%), of which 50.8% were alveolar pyorrhea and simple periodontitis. Malignant tumors and neuralgia were also seen, in agreement with the literature which we have cited.

Tsukushi<sup>8</sup>) listed the following postoperative complications in diabetic cases: Postoperative infections such as local infection, pneumonia, peritonitis, bile duct infection, and bladder infection; complications caused by tissue fragility such as wound disruption, prolonged convalescence, suture inadequacy, and hemorrhage; diabetic coma; and hypoglycemia. From the point of view of oral surgery, we can cite dry socket<sup>2,7,9,10</sup>) and postoperative infection<sup>11</sup>) as complications after tooth extraction. Two types of dry socket are distinguished by Ueno; primary dry socket, which occurs immediately after extraction, and secondary dry socket, which occurs after bacterial infection has caused dissolution of the blood clot in the socket<sup>12-15</sup>).

In our study we observed postextraction infection thought to be similar to the postoperative infections noted in surgery, sec-

ondary dry sockets, and sequestra around the sockets. Convalescence took an average of 54.2 days, which is considerably longer than normal.

According to Tsukushi<sup>8</sup>), it is not impossible to operate on diabetic cases, but to do so without previous treatment of diabetes and monitoring of the metabolism leaves the patient in danger of postoperative complications. The patient should first be controlled by diet, oral hypoglycemic agent, or insulin. A few days before the operation, sufficient sugar and insulin should be given to allow the storage of glycogen in order to prevent postoperative acidosis. Krall<sup>16</sup>) classified the state of control of diabetes as good (fasting blood-sugar less than 110 mg/dl), fair (less than 130 mg/dl), and poor (more than 130 mg/dl).

In our clinic we adhere to the following policy in regard to diabetic patients: Regardless of the treatment the patient was receiving before entering the clinic, we set a goal of a blood-sugar level less than 150 mg/dl, urinary sugar 5-10% of the total intake, and negative ketone body reaction; in preparation for operation we give sugar and sufficient insulin to utilize it. During the operation, if there are no complications and the ketone reaction is negative, we give no insulin. After operation sugar intake is usually not regular and in order to avoid hypoglycemia, we either do not give insulin or we give only a small amount consistent with the amount of sugar intake. Several days after operation, when oral intake again becomes possible, we give both sugar and insulin, as before operation, in order to prevent debilitation. Later, as the patient regains strength, we return to the pre-surgical diet and give insulin or oral hypoglycemic agents<sup>2,3</sup>).

Of the diabetic patients we studied, 80.6% without postoperative complications

had a preoperative fasting blood-sugar level of 142.4 mg/dl on the average, while those that developed complications (19.4%) averaged 194.5 mg/dl. Thus it can be said that the risk of postoperative complications is high in cases with a high fasting blood-sugar level. The fact that 44.4% of those who depended on insulin for control of their diabetes developed complications indicates a high incidence of complications in patients with relatively severe diabetes.

However, with few exceptions, none of the patients needing tooth extraction would consent to be hospitalized, and there was no extraction with patients in the hospital and under our care. Either the patient had the extraction without any special preoperative care beyond his normal diabetes control, or in spite of the need for diabetes control, none at all was exercised before the extraction. Often the patient's doctor, without understanding the exigencies of oral surgery, would request tooth extraction for a patient that was in the "poor" class of Krall<sup>16</sup>, or extractions were performed without giving us time to set up a regime of preparatory control. These various factors are the main cause of the postoperative complications that we observed.

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#### REFERENCES

- 1) Murachi, T.: Frequency of diabetes in Japan. *In Tonyoby no rinsho (Clinical diabetes and its fundamental basis)*. (in Japanese), ed. by M. Wada and M. Abe. Igakushoin, Tokyo, 1970, pp. 1-6.
- 2) Shimizu, M., Motegi, K., Sekiyama, S., and Noda, K.: Two cases of odontogenic infections of the jaws with diabetes (in Japanese). *Nippon Kokugeka-Gakkai-Zasshi*, 14: 21-28, 1968.
- 3) Motegi, K., Yamazato, S., Mizuno, A., Michi, K., Hiyama, T., Shimizu, M., and Kashiwagi, H.: Clinical experiences of dental extraction in a patient with hemophilia A and hypopituitarism (in Japanese). *Kokubyo-Gakkai-Zasshi*, 39: 64-71, 1972.
- 4) Wada, M.: Symptoms of diabetes mellitus. *In Tonyoby no subete (Diabetes mellitus)*. (in Japanese). ed. by N. Katsuya and K. Shizume. Nankodo, Tokyo, 1971, pp. 326-332.
- 5) Marble, A., White, P., Bradley, R. F., and Krall, L. P.: *Joslin's Diabetes mellitus*, 11th Ed. Lea and Febiger, Philadelphia, 1971.
- 6) Finestone, A. J., et al: Trigeminal neuralgia and diabetes mellitus. *J. Med. Soc. N. J.*, 67: 269, 1970.
- 7) Ueno, T.: Dentistry and diabetes. *In Tonyoby no rinsho (Clinical diabetes and its fundamental basis)* (in Japanese), ed. by M. Wada and M. Abe. Igakushoin, Tokyo, 1970, pp. 227-231.
- 8) Tsukushi, S.: Surgery and diabetes. *In Tonyoby no subete (Diabetes mellitus)* (in Japanese), ed. by N. Katsuya and K. Shizume. Nankodo, Tokyo, 1971, pp. 530-540.
- 9) Mead, S. V.: *Oral surgery*, 4th Ed. Mosby, St. Louis, 1954, p. 570.
- 10) Zimmer, M. A.: Dry socket, a clinical study and method of treatment. *Dent. Cosmos*, 71: 1204-1207, 1929.
- 11) Suzuki, M.: A cases of infection of the mandible with hypertension, diabetes, and climacteric disorders (in Japanese). *Kokugeka-Gakkai-Zasshi*, 5: 173-174, 1959.
- 12) Ueno, T.: Dry socket, a clinical study and methods of treatment. I (in Japanese). *Nippon Dent. Rev.*, 257: 2-7, 1964.
- 13) Ueno, T.: Dry socket, a clinical study and methods of treatment. II (in Japanese). *Nippon Dent. Rev.*, 258: 7-15, 1964.
- 14) Ueno, T.: Dry socket, methods of treatment and preventions (in Japanese). *Shikai-Tenbo*, 33 (5): 847-856, 1969.
- 15) Ueno, T., Madan, B. S., and Shimizu, M.: Prevention of dry socket, surgical procedure. *J. Indian Dent. Assoc.*, 39 (9): 1-3, 1967.
- 16) Krall, L. P.: The oral hypoglycemic agents. *In Joslin's Diabetes mellitus*, ed. by A. Marble, P. White, R. Bradley, and L. P. Krall. Lea and Febiger, Philadelphia, 1971, p. 304.