CHAPTER 3

Acute medical complications in the dental practice

Reports of 471 dentists in the Netherlands

Abstract

Objective.

Drawing up an inventory of the number and nature of medical complications in the Dutch general dental practice in relation to the sort and moment of the treatment, with and without use of the Medical Risk Registration History list (MRRH), as well as the frequency and nature of the professional medical assistance called in to help.

Method.

Using a registration form, dentists, both MRRH users (n=51) and a control group (n=420), registered medical complications, followed by an anonymous questionnaire.

Results.

All in all, 471 dentists reported 91 complications, whereas a number of 300 complications was registered by 380 dentists in an anonymous questionnaire. None of the reported complications involved a life-threatening situation. Syncope and hyperventilation were frequently reported. Most complications occurred during local anaesthetic or treatment, with increasing stress levels of the treatment. Two-thirds of the complications could probably have been prevented using an anamnese. Medical assistance was called for in 6% of the cases.

Conclusion.

Presumably, life-threatening disorders are rarely found in the general dental practice, also due to the absence of intravenous anaesthetic and general anaesthetic in the general dental practice in the Netherlands.

Reference: Internal Medicine - Medical Complications - Practice Management.

Introduction

More and more patients visiting a dentist are medically compromised. If their number was around 20 % in the seventies, nowadays, their number is estimated at 40 % (Abraham-Inpijn et al., 1994; Smeets et al., 1998).

The risk of medical complications during dental treatment is higher with medically compromised patients than with healthy individuals. Data on the prevalence and nature of medical complications in the general dental practice in the Netherlands is lacking. Some information is provided by professional literature, but up to now no systematic research has been conducted.

Using the Medical Risk Registration History list (MRRH), a medical risk profile (ASA score) of a patient in the dental practice can be drawn up (De Jong, 1992). The ASA-score, modified for treatment with and without local anaesthetic, provides dentists with a means to prevent medical complications.

In this article, the results of a one and a half year period of study of dentists are discussed.

The research was concerned with 6 questions:

1. What is the number of complications that occur in the general dental practice?
2. What kind of complications are they?
3. At what time do the complications occur?
4. Does the number of complications increase during more compromising dental treatment?
5. In how many cases of medical complications is medical intervention required?
6. How does the use of MRRH effect the number of medical complications?

Material and method

During a one and a half year (1993-1994) period, medical complications occurring before, during or after treatment in the general dental practice of dentists were registered. A medical complication was defined as a (temporary) decline of the physical condition of the patient between the moment of entering the dental practice and the time of departure. After having obtained permission, only the records of patients over 18 were used.

Two groups of dentists took part in the study. The first group used the MRRH dating from 1992, including preventive measures (reference group N=51) (De Jong, 1992). The second group of dentists was a random selection taken from the records of the "Nederlandse

Maatschappij tot bevordering der Tandheelkunde NMT" (Dutch Association for the Promotion of Dentistry). Out of a selection of 1000 dentists, a control group of 420 dentists was prepared to co-operate. These dentists used several methods to obtain medical data, no one using the MRRH, however. Some of these dentists did not take any anamnesis. Both groups of participating dentists showed similar demographical data where the size of their practice, their age and place of residence (city or countryside) was concerned.
For the registration of medical complications, a form with specific questions relating to the chronological order of the symptoms was used, so as to obtain the highest possible level of standardisation. The form contained information about: the moment that the complication occurred in relation to the sort of dental treatment and the course of the complication. Two independently operating internists then made a diagnose using the registration form. At the conclusion of the study, an anonymous questionnaire was handed out amongst the 470 dentists participating, and contained, amongst others, the question if one had really recorded all the medical complications that had taken place and, if not, why one had refrained from its registration.

Results

During a one and a half year period, 470 dentists recorded 91 acute medical complications, 6 of which were reported by 5 of the 51 dentists of the reference group. The remaining 85 cases were reported by 56 of the 420 dentists of the control group. The average age of the patients suffering from a medical complication was 28.7 years (ranging from 19 to 50 years) in the MRRH group, and 39.1 in the control group, ranging from 18 to 82 years. The man - woman relation was 2:4 in the reference group and 3:4 in the control group. Of a further 10 patients having a medical complication, the sex was unknown.
Besides the number and type of complications in both groups, Table 1 also shows the division between complications which could and could not have been prevented using MRRH. According to this set-up, 70% of the complications could have been prevented, 50% of which concerned the reference group, and 72% concerned the control group.
The most frequent diagnosis were hyperventilation syndrome, vasovagal collapse, orthostatical collapse, intravenous injection of local anaesthetic and a syncope of unknown origin.

Table 1:
Number and sort of complications, divided in the categories 'could be prevented' and 'could not have been prevented' among dentists using the MRRH (reference group) and a control group.

	Reference group (n=51)	**Control group (n=420)**
Complications which could have been prevented		
Hyperventilation	1	23
Vasovagal collapse	1	14
Orthostatical hypotension	1	13
Intraveneuze injection	-	8
VCI during pregnancy	-	2
Hypoglycaemic coma	-	1
Complications which could not have been prevented		
Syncope of unknown origin	1	7
Problems with local anaesthetic	1	3
Insult	-	2
Allergy type 1	1	-
Other/ No diagnosis	0	12
Total	6	85

VCI: Vena Cava Inferior Syndrome

Other: Bell's Palsy, facial pain, lung embolism, TIA, complication with Multiple Sclerosis, Asthma Bronchiale, Reaction to pain.

A: Check-up, **B**: Conservative treatment using local anaesthetic, **C:**Conservative treatment without local anaesthetic, **D**:Extraction and minor surgery

Table 2 shows the relation between the sort of medical complication and the sort of dental treatment, subdivided in four categories with hypothetically increasing physical and/or psychological stress. Apparently, vasovagal collapse, orthostatical hypotension and syncope of unknown origin occur more frequently with increasing stress levels. The hyperventilation syndrome is mainly registered during dental check-ups.

Table 2:
Relation between medical diagnosis and dental treatment

	A	B	C	D
Hyperventilation	15	2	7	-
Vasovagal collapse	1	1	13	-
Orthostatical collapse	-	4	1	9
Collapse ECI	-	1	1	6
Intraveneuze injection	-	6	-	2
VCI bij zwangerschap	-	2	-	-
Hypoglycemia	-	1	-	-
Other/ No diagnosis	-	10	3	6
Total	16	27	25	23

Other: Allergy, Problems with local anaesthetics, insult, Bell's Palsy, facial pain, lung embolism, TIA, complication with Multiple Sclerosis, Asthma Bronchiale, Reaction to pain.
A: Check-up, **B**: Conservative treatment using local anaesthetic, **C**: Conservative treatment without local anaesthetic, **D**: Extraction and minor surgery

Table 3 indicates the moment the complication happens in relation to the treatment. Only 6 out of 91 complications occurred before dental treatment had commenced.

Table 3:
Relation between medical diagnosis and the moment of the complication.

	A	B	C	D	E	F
Hyperventilation syndrome	1	2	2	10	4	5
Vasovagal collapse	-	-	1	2	5	6
Orthostatical collapse	-	-	-	1	-	13
Syncope of unknown origin	-	-	-	-	4	4
Intraveneuze injection	-	-	3	5	-	-
VCI during pregnancy	-	-	-	-	2	-
Hypoglycaemia	-	-	-	-	1	-
Problems with local anaesthetic	-	-	2	2	-	-
Insult	-	1	-	-	1	-
Other/ No diagnosis	1	1	-	1	2	8
Total	2	4	8	21	20	36

Other: Allergy, Bell's Palsy, facial pain, lung embolism, TIA, complication with Multiple Sclerosis, Asthma Bronchiale, Reaction to pain. **A**: Waiting room, **B**: Before treatment, **C**:During local anaesthetic, **D**: Immediately after local anaesthetic, **E**: During subsequent treatment, **F**:After treatment

The occurrence of hyperventilation is mostly seen immediately after local anaesthetic has been administered. The orthostatical hypotension and syncope is related to the patient getting up out of the chair.

In the reference group, 4 out of the 6 times a medical complication occurred, medical assistance was called for. In the control group, this request was made in 11 out of 85 complications registered. The reasons for this can be summed up as follows: insults, syncope of unknown origin, vasovagal collapse, orthostatical collapse, hyperventilation syndrome, lung embolism, Trans Ischaemic Attack (TIA), hypoglycaemia and peripheral paralysis of the facial nerve e.c.i.

At the conclusion of the study, 380 dentists (80%) returned the anonymous questionnaire. Of this group, 253 dentists (66,6 %), indicated they had not witnessed a medical complication during the registration period. Of the other dentists, 127 (33,4 %) recorded yet a total of 300 complications. A minority of the complications, i.e. 91, were recorded spontaneously during the registration period. The new, non-registered medical complications, brought to light serious problems which had not been reported at first: allergy (4 x), continued bleeding (1 x), insults (3 x), hypoglycaemia (3 x) and an aspirated crown. Furthermore, in an additional 38 complications, medical assistance was called for. In 23 of the cases, a general practitioner provided help, in 14 cases the patient was treated by a specialist in the first-aid post of a hospital and in one case the patient was admitted. The most important reasons for not reporting an complication were: 'lack of time', 'not of a serious enough nature', and 'forgotten'. Some dentists refrained from registration because of the detailed list of symptoms that had to be filled out.

Discussion

Research dealing with medical complications in the dental practice is mostly retrospective in nature (Coplans and Curson, 1982; Kleemann et al., 1982; Fast et al., 1986; Matsuura 1989a; Matsuura 1989b; Malamed, 1993a). Fast et al. (1986) reported 16,773 complications in 1,605 dental practices over a period of 10 years. Of these 16,773 complications, a total of 2,284 were of cardiovascular origin. Malamed (1993a) reported that, over a period of 10 years, 13,776 complications occurred in 2,704 dental practices, of which 1093 were of cardiovascular origin. Coplans and Curson (1982) describe 120 fatal medical complications in dental practices in England over a period of 10 years. Of these, 100 out of the 120 complications occurred during general anaesthesia. Matsuura (1989a, b) reports the death of 4 patients in 1984 and 5 patients in 1985 in dental practices in Japan. Kleemann et al. (1982) determined a mortality rate of 4 patients per million dental treatments.

In the present study, acute cardiovascular disorders like angina pectoris, coronary and decompensatio cordis were not reported. The use of intravenous anaesthesia and general anaesthesia is not allowed in the general dental practice in the Netherlands, whereas it does fall within the possible range of treatments in foreign dental practices. It is possible that the differences in the frequency of cardiovascular complications is due to different practice management and/or unsatisfactory reports of Dutch dentists. A further important factor is the average age of the patients in this study being under 40 years. The chance of patients suffering from cardiovascular diseases gets higher with progressing age. In professional literature the issue of age was not addressed.

As shown in the available literature, of the total number of medical complications during dental treatment, 40 to 70 % of the diagnoses concern vasovagal collapse and orthostatical collapse. Another 0 to 25 % of the cases deals with the hyperventilation syndrome. In is remarkable that Fast et al. (1986) do not report the occurrence of the hyperventilation syndrome and problems with local anaesthesia. Also, the hyperventilation syndrome is unknown in Iceland (Workshop European Medical Risk Related History, 1996). Both in the Netherlands and in other European countries, this syndrome receives much attention, which might have its influence on the frequency. The diagnose of 'hyperventilation syndrome', its symptomology and, as a consequence, its frequency are under discussion (Hornsveld, 1996).

In the present study, there appears to be an increase in the number of complications with increasing stress levels (pain, fear). This is to be expected, since during increasing stress, the

burden on the cardiovascular parameters is strongly augmented. (Abraham-Inpijn *et al.* 1988; Abraham-Inpijn, 1998 in press; Palmer-Bouva *et al.,* 1998 accepted). As the dental treatment progresses, the syncope will increase (vasovagal, orthostatic and syncope e causa ignota). This is related to the stress of the treatment (vasovagal) and the sudden movement of getting out of the chair after treatment (orthostatical). As anamnesis records were lacking with the majority of the patients, it is impossible to say whether medication was of any influence. The users of MRRH more frequently resort to medical help.

The question is whether medical complications could have been prevented. The VCI-syndrome which occurs during pregnancy is marked as 'could have been prevented' because a slightly sideways position of the body is enough to prevent it. The treatment of a diabetic leading to hypoglycaemia is part of the pathology registered using the MRRH, and does not have to lead to a comatose state if recognised at an early stage.

Determining the pulse frequency, measuring the blood pressure, determining the frequency and aspects of the patient's respiration and even the level of consciousness are a frequent source of problems, as has become clear from the filled out forms. The average Dutch dentist is probably not as skilled in the registration of vital signs as is his American colleague. In the United States, such medical training is an integral part of the programme (Greenberg, 1991; Malamed, 1993b).

References

Abraham-Inpijn L. De geneeskundige paradox en de tandheelkunde. In: Kwast WAM van der, Carlee A, *et al*, red. Het tandheelkundige jaar 1998. Houten/Diegem: Bohn Stafleu Van Loghum, 1998.

Abraham-Inpijn L, Borgmeijer-Hoelen A, Gortzak RaTh. Changes in bloodpressure, heart rate, and electrocardiogram during dental treatment with use of local anesthesia. J Am Dent Assoc 1988;116:531-536.

Abraham-Inpijn L, Keur I, Jong KJM de. De medisch gecompromitteerde patiënt in de tandheelkunde. Contactpunt; 1994;10:17-21.

Coplans MP, Curson I. Deaths associated with dentistry. Br Dent J 1982; 153: 357-362.

Fast TB, Martin MD, Ellis TM. Emergency preparedness: a survey of dental practitioners. J Am Dent Assoc 1986;112:499-501.

Greenberg MS. Increasing the medical training of dentists. Current Opin Dent 1991; 4: 460-463.

Hornsveld H. Farewell to the hyperventilation syndrome, Amsterdam: Universiteit van Amsterdam, 1996. Academisch Proefschrift.

Jong KJM de. The medical history in dentistry. Development of a risk-related patient-administered questionnaire for dental practice. Amsterdam: Universiteit van Amsterdam 1991. Academisch proefschrift.

Kleemann PP, Roth K. Frey R. Zum Stand der Notfallmedizin in der zahnärtzlichen Praxis. Analyse einer Umfrage, Dtsch Zahnärtzl Z 1982;37:452-456.

Malamed SF. Managing medical emergencies. J Am Dent Assoc 1993a;124:40-53.

Malamed SF. Physical evaluation and the prevention of medical emergencies: vital signs. Anesth Pain Control Dent 1993b;2: 107-113.

Matsuura H. Analysis of systemic complications and deaths during dental treatment in Japan. Anesth Prog 1989a; 36: 223-225.

Matsuura H. Systemic complications and their management during dental treatment. Int Dent J 1989b;39:113-121.

Palmer Bouva C, Oosting J, Vries R de, Abraham-Inpijn L. Stress in elective dental treatment: Epinephrine, Norepinephrine, VAS and CDAS in 4 different procedures, Gen Dent 1998; in press.

Smeets EC, Jong KJM de, Abraham-Inpijn L. Detecting the medically compromised patient in dentistry by means of the medical risk-related history (MRRH) in the Netherlands. Prev Med 1998; in press.