Geographical distribution, preoperative orthodontics, and morbidity of Norwegian patients surgically treated for mandibular prognathism

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The geographical distribution of 1169 Norwegian patients operated on for mandibular prognathism during the years 1975–1984 showed an accumulation of cases in the western and northern parts of the country. This skew distribution was probably due to genetic factors. No association was found between the number of operated patients and the number of orthodontists or oral and maxillofacial surgeons in the different counties. Most of the patients (69%) had less than 2 years and 10% had more than 4 years of preoperative orthodontic treatment. The use of presurgical orthodontics seemed to increase during the observation period, and the mean treatment time was shorter in the last half of the decade. The morbidity, defined as the duration of the hospital stay and the intermaxillary fixation period, was on an average 56 days, mostly dependent on the surgical unit. □ *Epidemiology; genetics; maxillofacial surgery*

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Severe mandibular prognathism requiring combined orthodontic and surgical treatment is estimated to occur in 1% of the Norwegian population (1). Many reports suggest a strong genetic influence in the transmission of mandibular prognathism (2–5). Although we have been unable to find reports on national geographical distribution of patients operated on for mandibular prognathism, some kind of geographical accumulation of these patients should be expected in a nationwide survey. Other factors, like the local surgical and orthodontic availability of specialists, probably also influence the geographical distribution of the patients.

Preoperative orthodontic treatment is well accepted and is nowadays used in most patients requiring orthognathic surgery (6–8). The literature gives no information about the total time spent on presurgical orthodontics.

The morbidity connected with surgical correction of mandibular prognathism is of some national economic interest. Do different surgical techniques or different surgical units influence total morbidity?

In Norway 1169 patients were surgically treated for mandibular prognathism in the period from 1975 to 1985. In an earlier published report the age and sex distribution, surgical techniques, and duration of hospital stay were discussed (1).

The aim of this study was to evaluate the geographical distribution, the extent of preoperative orthodontic treatment, and the total morbidity of these patients.

Materials and methods

All the nine oral/maxillofacial surgery units (Table 1) performing orthognathic surgery in Norway responded to the following:

1. The number, age, sex, and home address of the patients operated on for mandibular prognathism in the decade 1975–1985.

2. The extent of preoperative orthodontic treatment.

Table 1. Regional distribution of 1169 Norwegian patients operated on for mandibular prognathism at nine oral and maxillofacial surgery units during 1975–1984

	Oslo	Stavanger	Bergen	Førde	Ålesund	Molde	Trondheim	Bodø	Dental School, Oslo	Total
Oslo	80	0	0	0	0	0	0	0	21	101
Østfold	29	0	0	0	0	0	0	0	3	32
Akershus	58	0	0	0	0	0	0	1	11	70
Oppland	22	0	0	0	0	0	0	0	6	28
Hedmark	40	0	0	0	0	0	0	0	3	43
Buskerud	22	0	0	0	0	0	0	0	3	25
Vestfold	23	0	1	0	0	0	0	0	2	26
Telemark	27	0	1	0	0	0	0	0	0	28
Aust-Agder	13	0	8	0	0	0	0	0	3	24
Vest-Agder	10	0	18	0	0	0	0	0	2	30
Rogaland	7	31	35	0	0	0	1	0	2	76
Hordaland	0	0	141	0	0	0	3	0	0	144
Sogn og Fjordane	1	0	24	9	19	0	0	0	1	54
Møre og Romsdal	5	0	10	0	133	40	0	0	0	188
Sør-Trøndelag	2	0	2	0	2	0	46	0	0	52
Nord-Trøndelag	5	0	2	0	0	0	26	0	0	33
Nordland	5	0	1	0	0	0	5	121	0	132
Troms	5	0	1	0	1	0	0	47	1	55
Finnmark	0	0	0	0	0	1	1	26	0	28
Total	354	31	244	9	155	41	82	195	58	1169

3. The duration of the hospital stay and the intermaxillary fixation period.

In Norway there are 20 counties. The patients were classified in accordance with their home county. The number of patients operated on for mandibular prognathism and its relation to the population size and to the availability of orthodontic and surgical services in each county were determined.

Results

Of the 1169 patients operated on for mandibular prognathism in Norway from 1975 to 1985, 665 (56.9%) were females and 504 (43.1%) males. The mean age was 23.6 years.

The geographical distribution of the patients in relation to the surgical units (Table 1) shows that Ullevål Hospital in Oslo, Haukeland Hospital in Bergen, and the Clinic of Oral Surgery and Oral Medicine in Oslo covered a region of several counties each, whereas the other hospitals mainly served their own county.

Table 2 illustrates the patient to population ratio in each county. There is great variation between the different counties. The ratio was highest in Møre and Romsdal, with 0.8 pro mille, and lowest in Buskerud, with 0.12 pro mille. The average for the whole country was 0.29 pro mille.

The distribution of orthodontists and oral and maxillofacial surgeons in Norway is uneven in relation to the population. There seemed, however, not to be any association between the orthodontic and surgical services available locally and the number of patients treated (Table 2).

Of 973 patients 752 (77.3%) had preoperative orthodontics. The use of such treatment increased from about 60% of the patients in the first half of the observation period to about 80% in the second half.

The total time spent on presurgical orthodontics is shown in Table 3. For most of the patients (69%) the orthodontic treatment period lasted less than 2 years, but as many as 10% was treated longer than 4 years. The distribution by county showed variation in

Table 2. Patient to population ratio in relation to orthodontic and surgical services for 1169 patients operated on for mandibular prognathism in Norway during 1975–1984

	Population*	Patients	Patients/ population, in 0/00	Orthodontists†	Patients/ orthodontists	Surgeons†	Patients/ surgeons
Oslo	452,000	101	0.22	36	2.8	21	4.8
Østfold	233,300	32	0.14	6	5.3	1	32.0
Akershus	369,200	70	0.19	9	7.8	3	23.3
Oppland	180,800	28	0.15	3	9.3	1	28.0
Hedmark	187,200	43	0.23	5	8.6	1	43.0
Buskerud	214,600	25	0.12	7	3.6	3	8.3
Vestfold	186,700	26	0.14	5	5.2	2	13.0
Telemark	162,000	28	0.17	5	5.6	1	28.0
Aust-Agder	90,600	24	0.26	4	6.0	0	0.0
Vest-Agder	136,700	30	0.22	5	6.0	2	15.0
Rogaland	305,500	76	0.25	7	10.9	1	76.0
Hordaland	391,500	144	0.37	14	10.3	10	14.4
Sogn og Fjordane	105,900	54	0.51	2	27.0	1	54.0
Møre og Romsdal	236,000	188	0.80	7	26.9	2	94.0
Sør-Trøndelag	244,800	52	0.21	4	13.0	3	17.3
Nord-Trøndelag	125,800	33	0.26	2	16.5	0	0.0
Nordland	244,500	132	0.54	7	18.9	1	132.0
Troms	146,800	55	0.37	2	27.5	0	0.0
Finnmark	78,300	28	0.36	0	0.0	0	0.0
Norway	4,092,200	1,169	0.29	130	9.0	53	22.5

* Source: *Statistical Yearbook of Norway*, 1985

† Source: *Handbook of the Norwegian Dental Association*, 1984.

Table 3. Number of patients and duration of the presurgical orthodontic treatment. Of 973 patients 752 (77.3%) had preoperative orthodontics. The figures in parentheses represent the percentage distribution among the different groups

Year of operation	Duration of orthodontic treatment						
	0–1 year	1–2 years	2–3 years	3–4 years	>4 years	Unknown	Total
1975	13 (35.1)	10 (27.0)	7 (18.9)	2 (5.4)	5 (13.5)	11	48
1976	4 (10.8)	18 (47.4)	7 (18.4)	2 (5.3)	7 (18.4)	11	49
1977	10 (18.5)	21 (38.9)	13 (24.0)	4 (7.4)	6 (11.1)	6	60
1978	6 (9.8)	40 (65.6)	6 (9.8)	4 (6.6)	5 (8.2)	5	66
1979	8 (12.5)	29 (45.3)	14 (21.9)	6 (9.4)	7 (10.9)	5	69
1980	22 (33.8)	29 (44.6)	8 (12.3)	2 (3.1)	4 (6.2)	15	80
1981	17 (30.4)	25 (44.6)	6 (10.7)	0 (0.0)	8 (14.3)	20	76
1982	29 (38.7)	31 (41.3)	7 (9.3)	4 (5.3)	4 (5.3)	11	86
1983	21 (23.6)	38 (42.7)	14 (15.7)	7 (7.9)	9 (10.1)	18	107
1984	24 (29.6)	34 (42.0)	11 (13.6)	5 (6.2)	7 (8.6)	30	111
Total	154 (24.8)	275 (44.4)	93 (15.0)	36 (5.8)	62 (10.0)	132	752

the time spent on orthodontics. About 25% of the patients from Vest-Agder and from Hordaland had more than 3 years of preoperative treatment, whereas the number from Oslo was only 6%. The number of patients with a short period of orthodontics increased, and those with no preoperative orthodontics seemed to decrease. There was no sex difference with regard to the duration of the orthodontic treatment between males and females.

The patient morbidity may be estimated by the period of hospitalization and intermaxillary fixation. The hospital stay and intermaxillary fixation period appear to be influenced both by the surgical unit performing the operation and by the applied surgical technique. The upper extreme is represented by patients operated on with a sagittal split procedure at the Nordland District Hospital, which resulted in a mean hospitalization of 13 days and a fixation period of 56 days, a total morbidity of 69 days. The lower extreme were patients with 3 days in hospital and 42 days with intermaxillary fixation after an extraoral ramus osteotomy performed in the District Hospital in Rogaland. The mean value for hospitalization was 8.4 days and for the intermaxillary fixation period 48 days for the entire material.

Discussion

This study does not represent an epidemiologic survey of mandibular prognathism, but with the increasing offer of surgical and orthodontic service for patients with this anomaly, the geographical distribution of the operated patients should give some indication of the occurrence of mandibular prognathism in the different counties in Norway. The fact that genetic factors are predominant in the determination of the development of mandibular prognathism (2–5) supports to some extent the value of the geographical distribution of the operated patients as epidemiologic data. Grude (9) found in 1962 an accumulation of patients with genuine mandibular prognathism in the southern part of Nordland, close to Trøndelag. He described the anomaly as 'the chin of Trøndelag' because this typical feature is relatively common in the counties of Trøndelag. In this material, however, surgical correction of mandibular prognathism was not found to be particularly common in the counties of Trøndelag. The highest incidence of operated patients was in the coastal counties of western Norway, and the lowest was in the eastern part of the country. The most plausible explanation is genetic factors, as we found no association between the number of

operated patients and the number of orthodontists or oral and maxillofacial surgeons in the different counties. All the oral or maxillofacial surgeons were taken into account, although only some of them were engaged in orthognathic surgery. They could, however, like the orthodontists, refer the patients to a unit for orthognathic surgery.

Until 1967 Ullevål Hospital in Oslo was the only hospital performing orthognathic surgery and thus had a nationwide function. Later the country was divided into five health regions with regional hospitals with full medical and surgical services. This study shows that only Haukeland Hospital in Bergen and Ullevål Hospital in Oslo seemed to have some regional function. District hospitals, especially in western Norway, started orthognathic surgical services later, which probably explains the relatively high incidence of operated patients in this part of the country.

The treatment for mandibular prognathism in Norway is free. The hospitalization and the preoperative orthodontics are paid for by the national health insurance scheme. Those employed will get sick pay while in the hospital and during the intermaxillary fixation period. Therefore, the patient's economy does not represent a barrier to this kind of combined treatment.

The role of orthodontist in the planning and in the pre- and post-operative treatment is invaluable. Even Angle (10) in 1903 suggested that the only possible way to correct true mandibular prognathism was by a combination of orthodontics and surgery. Many patients seem to have had orthodontic treatment to correct the dental and alveolar component of the prognathism in their early teens. When an optimal end result was not achieved or a relapse occurred, these patients had to go through another period of orthodontic treatment to align the dental arches before surgery. Thus the total time of orthodontic treatment was prolonged in many cases. Better understanding of the nature of mandibular prognathism and improved cooperation between orthodontists and maxillofacial surgeons will probably reduce this treatment time.

The hospital stay and the intermaxillary fixation period were mostly dependent on the surgical unit involved. Reitzik (11) stated that bony healing takes 25 weeks after a vertical ramus osteotomy, and many authors (12, 13) recommend a long fixation period for a stable result. With a good postoperative dental occlusion, other surgeons (6, 14, 15) feel that 6 weeks are sufficient. Newer concepts show that with stable osteosynthesis, only 1 week of intermaxillary fixation will be needed (16, 17). The hospital stay in Norway is dependent on certain geographical conditions (1). The introduction of corticosteroids as an efficient inhibitor of the postoperative inflammatory reaction helps to keep the patients' swelling and discomfort at a minimum. Together with increased use of stable osteosynthesis, this opens the possibilities for reducing the morbidity after surgical correction of mandibular prognathism.

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