Questionnaire Survey of Metal Plate Construction

by

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I. Introduction

Metal plates are available as cast plates or swaged plates [1]. At present, swaged plates are not much used, and cast plates are used in most cases. The construction of a cast plate [2,3] requires a number of machines, and the material and technical processes are complex [4-6]. In Japan, the construction of metal plates for patients attending private dental clinics is entrusted to private laboratories. At the Nihon University Dental Hospital, metal plates for patients are made at a metal plate laboratory within the hospital itself. The number of plates made at this laboratory ranges from 100 to 150 a year.

Accordingly, we conducted a questionnaire survey of 98 private metal plate laboratories in all parts of Japan, in order to assess the existing state of metal-plate construction. Thirty-four laboratories responded, and their answers are analyzed and reported on in this paper.

II. Survey Method

Questionnaires were sent to 98 private metal-plate laboratories which are members of a Trade Association formed by their operators, and the questions referred to metal plates constructed during 1982. Thirty-four laboratories replied, and these replies were analyzed. The survey was in two parts, one covering general subjects and the other methods of construction. Incidentally, differences in the numbers of answers arise from the fact that no answers were given to certain questions by certain respondents.

III. Results

1. General Subjects

1) Number of Metal Plates Constructed

The relationship between the number of metal plates constructed, including full and partial plates, and the number of laboratories which made them, is shown in Table 1 and Figs. 1 and 2. As can be seen in Fig. 2, the percentage of laboratories making less than 1,000 plates a year was the highest at 47.8%. The largest number of plates constructed at any one laboratory was 12,600.

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Fig. 1.

Table 1

Number constructed	Number of cases
1 ~ 999	11
1000 ~ 1999	5
2000 ~ 2999	1
3000 ~ 3999	4
4000 ~ 5000	1
10000 or more	1

Fig. 3.

Fig. 4.

Table 2

Number constructed	Number of cases
1 ~ 499	16
500 ~ 999	3
1000 ~ 1499	2
1500 ~ 1999	2
2000 ~ 2499	0
2500 ~ 3000	1

Table 3

Number constructed	Number of cases
1 ~ 999	14
1000 ~ 1999	3
2000 ~ 2999	4
3000 ~ 3999	1
9000 ~ 10000	1

Ratio of number of partial metal plates to total

Fig. 7.

Table 4	
Partial Metal Plate %	Office
0 ~ 29	0
30 ~ 39	1
40 ~ 49	1
50 ~ 59	5
60 ~ 69	6
70 ~ 79	7
80 ~ 89	6
90 ~ 100	1

Fig. 8.

2) Full Metal Plates

The relationship between the number of full metal plates constructed and the number of laboratories which made them, is shown in Table 2 and Figs. 3 and 4. As can be seen in Fig. 4, the percentage of laboratories making less than 500 a year was the largest at 66.7%.

3) Partial Metal Plates

The relationship between the number of partial metal plates constructed and the number of laboratories which made them is shown in Table 3 and Figs. 5 and 6. As can be seen in Fig. 6, the percentage of laboratories making less than 1,000 a year was the largest at 60.9%.

4) Ratio of Partial Metal Plates to Total

The ratio of the number of partial metal plates constructed in the year at the various laboratories against the total number of metal plates constructed is given in Table 4 and Figs. 7 and 8. As can be seen in Table 4, partial metal plates accounted for more than 50% at 25 laboratories, and for less than 50% only at 2 laboratories. This means that partial plates account for more than 50% of the total at most laboratories.

2. Methods of Construction

1) Ventilation Provided for Laboratories

Provided: 100% Not provided: 0%

2) Implements and Materials Used

Use one company's system only: 38% (13 labs.)

Use various companies' systems: 62% (21 labs.)

3) Type of Surveyor Used

Ney's products: 77% Other products: 23%

4) Most Frequently-Used Clasps

(1) Maxilla

(i) Kennedy class I and II

I-bar clasp: 44% Aker's clasp: 33% Others: 23%

(ii) Kennedy class III

Aker's clasp: 91% I-bar clasp: 6% Others: 3%

(2) Mandible

(i) Kennedy class I and II

I-bar clasp: 61% Aker's clasp: 26% Others: 13%

5) Is Attachment Done?

Yes: 91% (31 labs.) No: 9% (3 labs.)

6) Are Swaged Metal Plates Made?

Yes: 21% (7 labs.) No: 79% (27 labs.)

7) Are Crowns and Bridges Made?

Yes: 88% (30 labs.) No: 12% (4 labs.)

8) Metals Used for Cast Plates

(1) Co-Cr alloy only: 37%

(2) Ni-Cr alloy only: 9%

(3) Co-Cr and Ni-Cr alloys: 3%

(4) Au alloy, Co-Cr and Ni-Cr alloys: 51%

- 9) Average Number of Days Required for Construction
 - (1) Full plate: 4.0 days
 - (2) Partial plate: 4.3 days
- 10) Prices (Average for 34 labs.)

	Co-Cr alloy	Au alloy
(1) Full plate	¥20,700	¥34,000
(2) Partial plate	27,400	42,300
- 11) Duplicate Impression
 - (1) Flask material
Metal: 80% Plastic: 11% Others: 9%
 - (2) To what degree is hydro-colloid impression-material used?
 - (i) Number of plates
Up to 30 plates: 75%
31 to 60 plates: 5%
60 plates or more: 20%
 - (ii) Number of days
10 days or less: 46% 11 to 20 days: 21%
21 to 30 days: 29% More than 30 days: 4%
 - (3) Bases for judging the limit of the use of hydro-colloid impression-material
Elasticity change: 54% Color-tone change: 14%
From experience: 11% Others: 21%
 - (4) Fluid temperature of hydro-colloid impression-material
39–40°C: 15% 51–55°C: 32%
41–45°C: 15% 56–58°C: 9%
46–50°C: 29%
 - (5) Cooling methods for hydro-colloid impression-material
 - (i) Natural cooling and water cooling: 71%
 - (ii) Natural cooling only: 12%
 - (iii) Water cooling only: 17%
- 12) Refractory Casts
 - (1) After pouring the refractory material into the hydro-colloid material, how many minutes are allowed before it is taken out?
40 minutes or less: 48% 41–80 minutes: 48%
81 minutes or more: 4%
 - (2) Type of coating material for refractory cast
Wax bath: 53% Spray: 11% Others: 36%
- 13) Waxing
 - (1) Use of stipple wax
For maxilla only: 76%
For maxilla and mandible: 21%
Not used: 3%
 - (2) Fixing of finish-line position
Under doctor's instruction: 14%
Fixed by laboratory: 86%

- (3) Resin plate retention form
 Mesh form: 23% Loop form: 15%
 Letter V form: 3% Others: 59%
- 14) Investing
 (1) Number of sprues
	Mean	Max	Min
Maxilla	2.4	6	1
Mandible	2.0	5	1
- (2) Casting ring
 Ring used: 15%
 Ringless: 85%
{	Plastic:	67%
	Metal:	27%
	Rubber:	3%
	Others:	3%
- (3) Investment material mixing
 Vacuum mixing: 73%
 Manual mixing: 27%
- (4) Burn-out period
 After investing, within 1 hour: 9%
 about 1 hour: 18%
 more than 1 hour: 73%
- 15) Casting Machines
 (1) Metal melting method
 High-frequency induction-heating furnace: 79%
 Arc furnace: 15% Electric furnace: 3% Others: 3%
- (2) Casting methods
 Centrifugal method: 82% Vacuum compression method: 8%
 Compression casting method: 8% Others: 2%
- (3) Casting machines
 Horizontal high-frequency centrifugal machine: 79%
 Arc-compression casting machine: 16%
 Oxygen-acetylene melting centrifugal-casting machine: 5%
- 16) Causes of Cast Plate Reconstruction
 (1) Responsibility of doctors: 79%
{	Poor casts:	78%
	Poor design:	19%
	Others:	3%
- (2) Responsibility of laboratories: 21%
{	Faulty casting:	68%
	Poor design:	21%
	Others:	11%
- 17) Fracture Points
 (1) Clasp: 76%
 (2) Border between minor connector and plate: 16%
 (3) Bar of plate: 6%
 (4) Others: 2%

IV Summary

The system used for cast-plate construction at the Nihon University Dental Hospital was developed by Shofu, Inc. (Japan). The duplicating hydro-colloid material, the hydro-colloid duplicating dispenser, the refractory cast material, the Co-Cr alloy and the casting machines are all supplied by Shofu, Inc. While 100 to 150 cast plates are made a year, swaged metal plates are not made at all.

Cast plates used at the Hospital, therefore, are limited in the method of construction, the number of plates and the system of application. Because of this, an assessment of the existing state of metal plate construction in the country was sought by means of a survey of dental laboratories since these make almost all the metal plates for patients attending private dental clinics.

Answers from 34 laboratories were analyzed and tabulated as below.

1. The percentage of laboratories making less than 999 metal plates a year was the highest at 47.8%, and the highest number of plates made in a year at any one laboratory was 12,600.
2. The percentage of laboratories making less than 500 full metal plates a year was 66.7% of the total, the highest.
3. The percentage of laboratories making less than 1,000 partial metal plates a year was 60.9% of the total, the highest.
4. The ratio of the number of partial metal plates to the total number of metal plates constructed a year at any one laboratory ranged from 70 to 79% at 7 laboratories or 27% of the total, the highest.
5. It was shown that a greater number of laboratories used implements and materials from various makers in constructing their metal plates rather than limiting their suppliers to a single maker.

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