

Gold allergy in Japan

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In Japan, gold dermatitis due to ear piercing increased in the early 1990s, but has subsequently become rare. To evaluate this clinical finding and to determine the frequency of gold allergy in Japan, we analysed the results of patch testing with 0.2% gold chloride from 1990 to 2001. 653 patients were tested from March 1990 to December 2001. 55 patients showed a positive reaction to gold (8.4%). Significantly more women (10.2%) than men (0.8%) reacted ($P < 0.005$), but there was no significant difference between positive rates from 1990 to 1995 (9.2%) and from 1996 to 2001 (7.2%). Our data suggest that patients with gold allergy did not decrease in number, despite a decreased number of patients showing clinically overt gold dermatitis. Thus, gold allergy has changed from being clinically overt to becoming occult in Japan.

Key words: allergic contact dermatitis; contact allergy; ear piercing; gold; patch testing technique.
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From the 1980s to the early 1990s, ear piercing became popular, especially among young women, in Japan. As a result, we saw 35 cases of gold dermatitis due to ear piercing from 1989 to 1992 (1). These patients developed recurrent earlobe redness and swelling, and later intracutaneous nodules (2). Biopsies revealed dense infiltration of lymphoid cells and eosinophils in the dermis. Such infiltration is characterized by the proliferation of helper/inducer T cells, and suppressor/cytotoxic T cells immunohistologically (2). Such patients, however, have subsequently become rare. To evaluate this clinical finding and to determine the frequency of gold allergy in Japan, we analysed the results of patch testing with 0.2% gold chloride from 1990 to 2001.

Materials and Methods

The subjects were 653 patients (122 men and 531 women; mean 37.0, SD $\pm$ 16.8 years; Table 1) at the Department of Dermatology, Showa University Hospital, tested from March 1990 to December 2001. These represent all patients tested with a metal series in the department over a 12-year period. 390 (72 men and 318 women; mean 34.0, SD $\pm$ 15.0 years; Table 1) were tested from 1990 to 1995, and 263 (50 men and 213 women; mean 41.6, SD $\pm$ 18.3 years; Table 1) from 1996 to 2001. The number with eczema, including a clinical diagnosis

of contact dermatitis, was 422 (64.6%) (Table 2). No patients had other overt significant health problems. Patch tests with 0.2% gold chloride (Torii Pharmaceutical Co., Ltd, Japan, purity $\sim$ 100%), were applied on the back for 2 days, with vinyl plaster (Mini-plaster[®] or patch tester TO-RII[®], Torii Pharmaceutical Co., Ltd, Japan).

The results were read with the ICDRG scoring system 3 days after application (3). Reactions of + to + + + were regarded as positive. Reactions difficult to judge because of technical limitations were excluded. Differences in positive rates between men and women, those from 1990 to 1995 and from 1996 to 2001, and those with and without pierced ears (based on clinical findings) were ana-

Table 1. Demographics

	1990–95	1996–2001	Total
Men			
No.	72	50	122
Average age (Years)	34.0 (SD $\pm$ 15.1)	41.8 (SD $\pm$ 18.3)	37.0 (SD $\pm$ 17.0)
Women			
No.	318	213	531
Average age (Years)	34.0 (SD $\pm$ 15.0)	41.6 (SD $\pm$ 18.3)	37.0 (SD $\pm$ 16.8)
Total			
No.	390	263	653
Average age (Years)	34.0 (SD $\pm$ 15.0)	41.6 (SD $\pm$ 18.3)	37.0 (SD $\pm$ 16.8)

Table 2. Incidence of dermatologic disease in tested patients

Disease	No.
Eczema	422
Contact dermatitis	299
Atopic dermatitis	32
Other eczema	91
Palmoplantar pustulosis	100
Lichen planus	28
Mucosal disorder	11
Epidermal cyst, keloid from ear piercing	18
Others	74
Total	653

Table 3. Positive rates by age group

Age group (years)	Total		1990–95		1996–2001	
	%	No.	%	No.	%	No.
≤ 19	14.3	(9/63)	17.1	(7/41)	9.1	(2/22)
20–29	13.0	(30/230)	14.2	(23/162)	10.3	(7/68)
30–39	5.6	(6/108)	8.5	(5/59)	2.0	(1/49)
40–49	2.5	(2/81)	1.9	(1/54)	3.7	(1/27)
50–59	3.8	(3/78)	0	(0/40)	7.9	(3/38)
≥ 60	5.3	(5/93)	0	(0/34)	8.5	(5/59)
Total	8.4	(55/653)	9.2	(36/390)	7.2	(19/263)

lysed with the χ^2 test. Differences were considered significant when $P < 0.05$.

Results

The positive rate to 0.2% gold chloride was 8.4% among 653 patients over 12 years (Table 3). This is the 4th highest rate after nickel, mercury and cobalt among 18 metals. There were significantly more women (10.2%; 54/531) reacting to gold chloride than men (0.8%; 1/122, $P < 0.005$). Table 3 contrasts the positive rates between patients from 1990 to 1995 and those from 1996 to 2001. The positive rate in the earlier 6 years was 9.2% (36/390); that in the later 6 was 7.2% (19/263). There was no significant difference in the results between the earlier and later 6 years. Table 3 also shows positive rates in each age group: in teenagers 14.3%, and 13.0% in the 20s (Table 3). Table 4 contrasts the positive rates in patients with and without ear piercing; there were significantly more positive reactions to gold in patients with pierced ears than in those without ($P < 0.0001$; Table 4).

Discussion

The positive rate to gold chloride over the 12 years was 8.4% (55/653; Table 3). This is the 4th highest rate among 18 metals, after nickel sulfate, mercuric chloride, and cobalt chloride (4). Since all subjects were patients, this rate does not predict the positive rate in the general population. However, as reported from several countries (5–9), gold should be regarded as a common allergen despite its stability. Most of the reactive patients were women (54/55; 98.1%). The North American Contact Dermatitis Group (NACDG) reported that 90.2% of patients allergic to gold were women (10). Table 3 shows the positive rates by age group. From 1990 to 1995, there was a tendency towards a higher rate in the younger age groups. The positive rate in teenagers was 14.3% (9/63), and was 13.0% (30/230) in the 20s (Table 3). Patients older than 50 did not react. These data suggest that gold sensitization was facilitated by ear piercing, as suggested earlier (11), because most of those individuals having their earlobes pierced in Japan until the early 1990s were young women. There were significantly more positive reactions to gold in patients with pierced than in those without pierced ears ($P < 0.0001$; Table 4). Sabroe et al. reported that 12 of 13 patients reacting positively to gold had pierced ears (7).

Since 1996, however, only 1 case of gold dermatitis has been seen in our hospital. The reason for this may be changes in ear-piercing materials. After earlobe piercing, many patients wore gold earrings immediately from the 1980s to the early 1990s. Subsequently, stainless or titanium earrings have been widely used as the 'first pierce' in Japan. Despite this decrease in gold dermatitis, there was no significant difference between positive rates from 1990 to 1995 and from 1996 to 2001 (Table 3). From 1996 to 2001, a tendency toward higher sensitization rates in the younger age groups was still present: positive rates in teenagers and the 20s were 9.1 and 10.3%, respectively. However, Table 3 also shows an increase in older patients reacting positively to gold. 3 in their 50s, and 5 of those older than 60 showed positive reactions to gold (Table 3). Table 5 shows the dermatologic disorders of positively reacting patients over the 12 years.

Table 4. Comparison of positive rates with/without ear piercing

	Pierced	Not pierced	
N. of patients	124	529	
Average age (years)	23.4 ± 6.1	40.0 ± 16.8	
SD			
Positive rates	29.0% (36/124)	3.6% (19/529)	$P < 0.0001$

Probability (P) was calculated by the χ^2 test.

Table 5. Number and dermatologic disorder of positive patients

	1990–95		1996–2001	
	No.	Disorder	No.	Disorder
++	29	Contact dermatitis	10	Contact dermatitis
		Atopic dermatitis		7
+	7	Contact dermatitis	9	Palmoplantar pustulosis
				Mucosal disorder
				Contact dermatitis
				Atopic dermatitis
Total	36		19	Palmoplantar pustulosis
				Mucosal disorder

From 1990–95, all except 1 were contact dermatitis patients (97.2%; 35/36) and 80.6% (29/36) showed strongly positive reactions (Table 5). In contrast, the proportion of contact dermatitis patients in the later 6 years was 63.2% (12/19). 7 patients with other skin diseases (palmoplantar pustulosis: 3, mucosal disorder, e.g. stomatitis, cheilitis, gingivitis: 3, and atopic dermatitis: 1) were also gold positive. The ratio of strongly positive patients in the later 6 years was 52.6% (10/19; Table 5). These findings suggest an increase in non-contact dermatitis patients, and a decrease in strongly positive-reacting patients among those reacting positively. Even though contact dermatitis patients, all except 1 gold dermatitis patient showed no clinical signs and symptoms suggesting gold allergy in the later 6 years. In this respect, the NACDG made an interesting suggestion: gold allergy has the propensity for facial and eyelid dermatitis (10).

Among 54 reactive patients, no positive reactions to gold chloride 3 days after application were weaker than at 2 days after. However, because gold chloride is known to have a risk of irritant reactions (12), recent studies use gold sodium thiosulfate (13, 14). We do not have data to compare the reactivity to the 2 materials.

In conclusion, gold should be regarded as a common allergen in Japan like other countries: the profile of positively reacting patients has been changing in the last 12 years. Although there was evidence of gold allergy in positively reacting patients from 1990 to 1995, fewer clinical signs were found from 1996 to 2001. Thus, gold has long been an important allergen, but gold allergy has changed from being clinically overt to becoming occult in Japan.

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