

Facial Dermatitis in Male Patients Referred for Patch Testing

Retrospective Analysis of North American Contact Dermatitis Group Data, 1994 to 2016

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IMPORTANCE Facial dermatitis in women is well characterized. However, recent shifts in the men's grooming industry may have important implications for male facial dermatitis.

OBJECTIVE To characterize male patients with facial dermatitis.

DESIGN, SETTING, AND PARTICIPANTS A 22-year retrospective cross-sectional analysis (1994-2016) of North American Contact Dermatitis Group (NACDG) data, including 50 507 patients who underwent patch testing by a group of dermatology board-certified patch test experts at multiple centers was carried out. Facial dermatitis was defined as involvement of the eyes, eyelids, lips, nose, or face (not otherwise specified).

MAIN OUTCOMES AND MEASURES The main outcome was to compare characteristics (including demographics and allergens) between male patients with facial dermatitis (MFD) and those without facial dermatitis (MNoFD) using statistical analysis (relative risk, CIs). Secondary outcomes included sources of allergic and irritant contact dermatitis and, for occupationally related cases, specific occupations and industries in MFD.

RESULTS Overall, 1332 male patients (8.0%) were included in the MFD group and 13 732 male patients (82.0%) were included in MNoFD. The mean (SD) age of participants was 47 (17.2) years in the MFD group and 50 (17.6) years in the MNoFD group. The most common facial sites were face (not otherwise specified, 817 [48.9%]), eyelids (392 [23.5%]), and lips (210 [12.6%]). Participants in the MFD group were significantly younger than MNoFD (mean age, 47 vs 50 years; $P < .001$). Those in the MFD group were less likely to be white (relative risk [RR], 0.92; 95% CI, -0.90 to 0.95) or have occupationally related skin disease (RR, 0.49; 95% CI, -0.42 to 0.58; $P < .001$) than MNoFD. The most common allergens that were associated with clinically relevant reactions among MFD included methylisothiazolinone ($n = 113$; 9.9%), fragrance mix I ($n = 27$; 8.5%), and balsam of Peru ($n = 90$; 6.8%). Compared with MNoFD, MFD were more likely to react to use of dimethylaminopropylamine (RR, 2.49; 95% CI, -1.42 to 4.37) and paraphenylenediamine (RR, 1.43; 95% CI, -1.00 to 2.04; $P < .001$). Overall, 60.5% of NACDG allergen sources were personal care products.

CONCLUSIONS AND RELEVANCE Although many allergens were similar in both groups, MFD were more likely to react to use of dimethylaminopropylamine and paraphenylenediamine, presumably owing to their higher prevalence in hair products. Most sources of allergic and irritant contact dermatitis in MFD were personal care products. This study provides insight into the risks and exposures of the increasing number of grooming products used by male dermatology patients. This will enable clinicians to better identify male patients who would benefit from patch testing and treat those with facial dermatitis.

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Few studies have evaluated patients with facial dermatitis (FD) referred for patch testing, and most have focused on women.^{1,2} However, male grooming has changed significantly in the past decade. A 2013 survey of 210 Dutch men found that 11.9% of men reported using a facial cream.³ Today, two-thirds of American fathers use a facial moisturizer.⁴ Dermatologists should be aware of new skin care products for men as potential causes of facial contact dermatitis. This analysis characterizes male patients referred for patch testing with FD.

Methods

The Minneapolis VAMC's Human Studies Subcommittee approved this study and waived written informed consent because all data were deidentified. The process of patch testing and reaction interpretation was performed per standard North American Contact Dermatitis Group (NACDG) protocol.⁵ This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline

Facial dermatitis was defined as involvement of eyes, eyelids, lips, nose, or face; if neck and/or ears were listed as the only secondary sites, these were also included. Scalp and all other body sites were excluded. From 1994 to 2016, 50 507 patients were patch tested to the NACDG screening series; 16 737 were male, including MFD (male participants with facial dermatitis; n = 1332 [8.0%]) and MNoFD (male participants without primary facial involvement; n = 13 732 [82.0%]). Overall, 1673 male patients who had a combination of facial and other body sites (n = 1664 [9.9%]) or did not have a site of dermatitis recorded (n = 9 [0.05%]) were excluded. Only current clinical relevance was included, defined as definite, probable, or possible relevance (per NACDG standards⁵).

Data was entered in Access (Access 2010; Microsoft Corp) and analyzed in Excel (Excel 2010; Microsoft Corp). No correction for multiple tests was employed; $P < .05$ was used as a cut-off for statistical significance. Relative risk (RR) and 95% CIs were calculated using SAS statistical software (version 9.2; SAS Institute, Inc).

Results

Frequency of FD

Overall, 1332 of male participants (8.0%) had FD; frequency increased from 5.6% (1994-1996) to 10.6% (2015-2016). In MFD, the most commonly affected site was face (not otherwise specified, 817 [48.9%]) followed by eyelids (392 [23.5%]), lips (210 [12.6%]), eyes (52 [3.1%]), and nose (8 [0.5%]). Neck and ear(s) were affected in 165 (12.4%) and 26 patients (2.0%), respectively, as secondary sites.

Demographics

Male participants with facial dermatitis were more likely to be younger (mean age, 46.5 [range, 3-92] years vs 49.7 [range 1-95]

Key Points

Question What characteristics, allergens, and sources are associated with male facial dermatitis?

Findings In this retrospective cross-sectional analysis of 50 507 patients who underwent patch testing, 1332 male patients had facial dermatitis, increasing from 5.6% in 1994 through 1996 to 10.6% in 2015 through 2016. Male patients with facial dermatitis were significantly younger than other male participants and commonly reacted to allergens in personal care products including preservatives, fragrances, hair dye, and surfactants.

Meaning Male patients with facial dermatitis appear to have unique sources of allergens that must be considered as male grooming practices evolve; dermatologists should be aware of these implications to adequately identify and treat patients.

years; $P < .001$) or atopic (559 [42.1%] vs 4856 [35.6%]; $P < .001$) (Table 1). Only half as many MFD had an overall occupationally related skin condition compared with MNoFD (139 [10.5%] vs 2921 [21.3%]; $P < .001$).

Clinically Relevant NACDG Allergens

Male patients with facial dermatitis were more likely to have reactions to dimethylaminopropylamine (DMAPA) (15/486 [3.1%] vs 56/4524 [1.2%]; $P = .001$) or paraphenylenediamine (PPD) (34/1332 [2.6%] vs 245/13708 [1.8%]; $P = .048$) than MNoFD, but were less likely to have clinically relevant reactions to traditional allergenic preservatives (Table 2).

Sources of Allergens and Irritants

Top sources of NACDG allergens included personal care products (PCPs) (n = 449 [60.5%]) and topical medications (n = 75 [10.1%]) (Table 3). Specific PCP sources included hair products (n = 69 [9.3%]) and moisturizers/lotions/creams (n = 56 [7.5%]). There were 162 identified irritant sources, most commonly PCPs (n = 44 [27.2%]) and industrial chemicals (n = 30 [18.5%]).

Occupations and Industries

There were 139 male participants with occupationally related FD. Top industries included manufacturing (durable goods, 53 [39.6%]; nondurable goods, 17 [12.7%]) and construction (9 [6.7%]). The most common occupations included machine operators/assemblers/inspectors (38 [28.4%]), precision production workers (14 [10.4%]), and mechanics/repairers (13 [9.7%]).

Discussion

This analysis has several important findings. First, the frequency of MFD referred for patch testing has doubled in the past 20 years. Second, although allergens associated with allergic contact dermatitis (ACD) are similar between MFD and MNoFD, reactions to the hair dye PPD and surfactant DMAPA were more common in MFD. Finally, most FD sources for both ACD and irritant contact dermatitis were PCPs.

Table 1. Patient Demographics, Male Participants With Facial Dermatitis vs Those Without Facial Dermatitis

Characteristic	No. (%)		MFD vs MNoFD	
	MFD (n = 1332) ^a	MNoFD (n = 13 732) ^b	RR (95% CI)	P Value ^c
Age, mean, y	46.5	49.7		<.001 ^d
>40 ^e	850 (63.8)	9562 (69.7)	0.92 (0.88-0.96)	<.001
<18	85 (6.4)	674 (4.9)	1.30 (1.04-1.62)	.02
19-39	374 (28.1)	3256 (23.7)	1.18 (1.08-1.30)	<.001
40-59	558 (41.9)	5624 (41.0)	1.02 (0.96-1.09)	.51
≥60	315 (23.6)	4174 (30.4)	0.78 (0.70-0.86)	<.001
Race				
White	1094 (82.3)	12 174 (89.2)	0.92 (0.90-0.95)	<.001
Nonwhite	235 (17.7)	1479 (10.8)		
Black	75 (5.6)	699 (5.1)		
Asian	96 (7.2)	385 (2.8)		
Hispanic	36 (2.7)	234 (1.7)		
Other	28 (2.1)	161 (1.2)		
Atopy				
Hay fever	368 (27.7)	3209 (23.4)	1.18 (1.08-1.30)	<.001
Eczema	237 (17.9)	2307 (16.8)	1.06 (0.94-1.20)	.34
Asthma	142 (10.7)	1664 (12.1)	0.88 (0.75-1.04)	.12
Any of 3 above ^e	559 (42.1)	4856 (35.6)	1.18 (1.11-1.27)	<.001
Final diagnosis ^f				
Contact dermatitis				
Allergic	639 (38.7)	7732 (43.3)	0.89 (0.84-0.95)	<.001
Irritant	253 (15.3)	2692 (15.1)	1.01 (0.90-1.14)	.81
Dermatitis				
Atopic	128 (8.4)	1529 (8.6)	0.97 (0.82-1.15)	.76
Seborrheic	127 (7.7)	84 (0.5)	16.33 (12.45-21.41)	<.001
Photodermatitis	30 (1.8)	163 (0.9)	1.99 (1.35-2.92)	<.001
Psoriasis	16 (1.0)	835 (4.7)	0.21 (0.13-0.34)	<.001
Other dermatoses	204 (12.3)	1254 (7.0)	1.76 (1.53-2.02)	<.001
Other dermatitis ^g	245 (18.4)	3550 (25.9)	0.79 (0.70-0.89)	<.001
Occupational-related dermatitis ^e				
Yes	139 (10.5)	2921 (21.3)	0.49 (0.42-0.58)	<.001

Abbreviations: MFD, male patients with facial dermatitis; MNoFD, male participants without facial dermatitis; RR, relative risk.

^a Men with facial dermatitis: race missing for 3 patients, hay fever history missing for 4 patients, eczema history missing for 2 patients, asthma history missing for 6 patients, final diagnosis missing for 4 patients, occupational relatedness missing for 4 patients.

^b Men without facial dermatitis: age missing for 4 patients, race missing for 79 patients, hay fever history missing for 27 patients, eczema history missing for 37 patients, asthma history missing for 30 patients, final diagnosis missing for 36 patients, occupational relatedness missing for 14 patients.

^c $P < .05$ was considered statistically significant.

^d t-Test.

^e MOHALFA (male, occupational, atopic, hand, leg or face dermatitis and age >40 years) Index.

^f Total number of final diagnoses (up to 3 diagnoses per patient).

^g Other dermatitis in male patients with facial dermatitis includes nummular eczema (n = 4), contact urticaria (n = 7), and other (n = 234); in men with no facial dermatitis includes stasis (n = 175), nummular eczema (n = 501), contact urticaria (n = 75), pompholyx (n = 197), and other (n = 2602).

It is not surprising that the number of MFD referred for patch testing has doubled over the past 2 decades as male-targeted PCP products have exploded over the past 5 years.^{6,7} Younger male patients may use more facial PCPs than older men; a 2018 Mintel study⁴ of 1000 men found that 84% of men aged 18 to 44 years used facial skin care products. This surge in skin care product use in younger men likely explains increased FD; importantly, these changes require that dermatologists inquire more directly about male grooming in cases of suspected facial contact dermatitis. Importantly, allergic rhinitis was also associated with FD. This finding may be owing to topical treatments for the signs of seasonal allergies including conjunctival redness, nasal congestion, and eye pruritus.⁸ This also represents an important component for dermatologists to consider.

Sites of Facial Involvement

The face (not otherwise specified) was affected nearly half of the time in MFD followed by eyes/eyelids; nose was the least affected. This is consistent with other studies^{1,2} and correlates with average skin thickness,⁹ which is important for allergen/irritant penetration.

Although eyelid dermatitis has been characterized in the past,¹⁰ male sex has not been highlighted. Importantly, nearly a quarter of MFD in this study had eyelid involvement. Gold, nickel, and fragrance are common causes of eyelid ACD. Possible eyelid exposures include eye care products, runoff from shampoos, antiaging products, ectopic transfer from hair/body products, connubial sources, and/or airborne allergens.¹⁰ Similarly, lip dermatitis has not been specifically analyzed by sex. Common allergens for lip dermatitis include fragrance-related allergens and nickel.¹¹ Because men use fewer lip products (11% of men vs 50% of women³), this likely explains their lower frequency of reactions.

Allergens and Sources

In general, clinically relevant allergens were similar in MFD and MNoFD, likely owing to the use of similar ingredients in facial and body products. Allergy to DMAPA, a surfactant, was more common in MFD compared with MNoFD. Because shampoos often cause facial/neck/scalp dermatitis,¹² we suspect this explains the findings. Allergy to PPD (in hair/moustache/beard/eyebrow dye) was also more common in MFD. The *Los Angeles*

Table 2. Top NACDG Allergens in Male Participants With Primary Facial Dermatitis Compared With Frequencies in Those Without Facial Dermatitis

NACDG Allergen	MFD		MNoFD		MFD vs MNoFD	
	Patients Tested, No.	Clinically Relevant Reactions, No. (%)	Patients Tested, No.	Clinically Relevant Reactions, No. (%)	RR (95% CI)	P Value ^a
Methylisothiazolinone, 0.2% aq	272	27 (9.9)	2359	275 (11.7)	0.85 (0.59-1.24)	.40
Fragrance mix I, 8% pet	1322	113 (8.5)	13722	1183 (8.6)	0.99 (0.82-1.19)	.93
Balsam of Peru, 25% pet	1331	90 (6.8)	13717	1254 (9.1)	0.74 (0.60-0.91)	.004
Dimethylaminopropylamine, 1% aq	486	15 (3.1)	4524	56 (1.2)	2.49 (1.42-4.37)	.001
Neomycin sulfate, 20% pet	1332	40 (3.0)	13700	427 (3.1)	0.96 (0.70-1.33)	.82
Nickel sulfate, 2.5% pet	1331	39 (2.9)	13708	573 (4.2)	0.70 (0.51-0.96)	.03
Oleamidopropyl dimethylamine, 0.1% aq	485	14 (2.9)	4519	85 (1.9)	1.53 (0.88-2.68)	.13
Quarternium-15, 2% pet	1332	36 (2.7)	13732	1043 (7.6)	0.36 (0.26-0.49)	<.001
Cinnamic aldehyde, 1% pet	1332	35 (2.6)	13709	349 (2.5)	1.03 (0.73-1.45)	.86
Formaldehyde, 1%-2% aq	1332	35 (2.6)	13718	1117 (8.1)	0.32 (0.23-0.45)	<.001
Paraphenylenediamine, 1% pet	1332	34 (2.6)	13708	245 (1.8)	1.43 (1.00-2.04)	.048
Methyldibromoglutaronitrile/phenoxyethanol, 2%-2.5% pet	1317	33 (2.5)	13660	652 (4.8)	0.53 (0.37-0.74)	<.001
Fragrance mix II, 14% pet	599	15 (2.5)	6042	244 (4.0)	0.62 (0.37-1.04)	.06
Propylene glycol, 30% and 100% aq	1323	31 (2.3)	13681	584 (4.3)	0.55 (0.38-0.78)	<.001
Lanolin alcohol, 30%-50% pet	1331	30 (2.3)	13722	342 (2.5)	0.90 (0.63-1.31)	.59
Amidoamine (stearamidopropyl dimethylamine), 0.1% aq	1163	21 (1.8)	11807	176 (1.5)	1.21 (0.77-1.90)	.40
Methylchloroisothiazolinone/methylisothiazolinone, 0.01% aq/pet	1321	23 (1.7)	13676	443 (3.2)	0.54 (0.35-0.81)	.003
Bacitracin, 20% pet	1324	22 (1.7)	13692	518 (3.8)	0.44 (0.29-0.67)	<.001
Cocamidopropyl betaine, 1% aq	994	15 (1.5)	10157	211 (2.1)	0.74 (0.43-1.22)	.23
Diazolidinyl urea (germall 115), 1.0% aq/pet	1318	19 (1.4)	13664	587 (4.3)	0.34 (0.21-0.53)	<.001
Carba mix, 3% pet	1331	17 (1.3)	13713	794 (5.8)	0.22 (0.14-0.36)	<.001
Bisphenol A/epoxy resin, 1.0% pet	1332	17 (1.3)	13711	132 (1.0)	1.33 (0.80-2.19)	.27
Compositae mix, 6% pet	993	13 (1.3)	10155	82 (0.8)	1.62 (0.91-2.90)	.10
Tixocortol-21-pivalate, 1% pet	1324	15 (1.1)	13691	287 (2.1)	0.54 (0.32-0.91)	.02
Cobalt (ii) chloride hexahydrate, 1% pet	1321	15 (1.1)	13686	341 (2.5)	0.46 (0.27-0.76)	.002
Budesonide, 0.1% pet	1320	14 (1.1)	13612	166 (1.2)	0.87 (0.51-1.50)	.61
Imidazolidinyl urea, 2% aq/pet	1318	14 (1.1)	13670	507 (3.7)	0.29 (0.17-0.49)	<.001
Colophony (Rosin), 20% pet	1332	14 (1.1)	13721	176 (1.3)	0.82 (0.48-1.41)	.47
2-Bromo-2-nitropropane 1,3-diol (Bronopol), 0.5% pet	1321	13 (1.0)	13674	245 (1.8)	0.55 (0.32-0.96)	.03
Iodopropynyl butylcarbamate, 0.5% pet	1163	12 (1.0)	11797	321 (2.7)	0.38 (0.21-0.67)	<.001

Abbreviations: MFD, male patients with facial dermatitis; MNoFD, male participants without facial dermatitis; NACDG, North American Contact Dermatitis Group; RR, relative risk.

^a $P < .05$ was considered statistically significant.

Table 3. Sources Containing NACDG Allergens, Non-NACDG Allergens, and Irritants Associated With Facial Dermatitis in Male Participants, 2001 to 2016

Source	No. (%)		
	NACDG Allergens	Non-NACDG Allergens	Irritants
Personal care products	449 (60.5)	73 (45.9)	44 (27.2)
Personal care products, NEC	246 (33.2)	27 (17.0)	9 (5.6)
Hair care products	69 (9.3)	7 (4.4)	8 (4.9)
Moisturizers, lotions, creams	56 (7.5)	7 (4.4)	2 (1.2)
Soaps and cleansers	22 (3.0)	0	6 (3.7)
Perfumes and fragrances	19 (2.6)	1 (0.6)	3 (1.9)
Sunscreens	9 (1.2)	9 (5.7)	2 (1.2)
Oral hygiene products	9 (1.2)	2 (1.3)	6 (3.7)
Eye care products	6 (0.8)	8 (5.0)	6 (3.7)
Dentistry materials	6 (0.8)	4 (2.5)	0
Lip products	5 (0.7)	7 (4.4)	1 (0.6)
Makeup	2 (0.3)	1 (0.6)	1 (0.6)
Topical medications	75 (10.1)	23 (14.5)	6 (3.7)
Clothing	24 (3.2)	4 (2.5)	3 (1.9)
Industrial chemicals	23 (3.1)	21 (13.2)	30 (18.5)
Food	20 (2.7)	7 (4.4)	3 (1.9)
Jewelry and watches	14 (1.9)	3 (1.9)	0
Plants and woods	13 (1.8)	9 (5.7)	2 (1.2)
Building materials	10 (1.3)	1 (0.6)	5 (3.1)
Glasses and contact lenses	7 (0.9)	0	0
Miscellaneous consumer items	4 (0.5)	0	1 (0.6)
Equipment/instruments	4 (0.5)	1 (0.6)	7 (4.3)
Safety equipment	4 (0.5)	1 (0.6)	4 (2.5)
Miscellaneous health products	3 (0.4)	0	8 (4.9)
Sanitizers/laundry detergents/disinfectants	3 (0.4)	4 (2.5)	3 (1.9)
Environmental	0	1 (0.6)	5 (3.1)
Persons	0	0	19 (11.7)
Other ^a	6 (0.8)	4 (2.5)	16 (9.9)
Unknown	83 (11.2)	7 (4.4)	6 (3.7)
Total	742	159	162

Abbreviation: NACDG, North American Contact Dermatitis Group; NEC, not elsewhere classified.

^a Other category includes NACDG allergen sources: other NEC (n = 3), cell phones (n = 1), nail polish (n = 1), oral/intramuscular/subcutaneous medications (n = 1), tools (n = 1), and non-NACDG allergen sources: oral/intramuscular/subcutaneous medications (n = 2), animals (n = 1), other NEC (n = 1); for irritant sources: other NEC (n = 9), animals (n = 3), sewage/waste/debris (n = 3), nonradiating ore (n = 1).

Times reported¹³ that the frequency of hair dyeing in men more than tripled from 1999 to 2010. Methylisothiazolinone/methylchloroisothiazolinone was a common allergen in both groups; this problematic chemical in the preservative family is responsible for a worldwide allergy epidemic. They can be found in nearly all types of liquid-based PCPs.¹⁴

Personal care products were responsible for more than half of the sources responsible for ACD and more than one-quarter of the sources for irritant contact dermatitis. This is unsurprising because many men use hair products (shampoo, 93%; conditioner, 10%; hairspray/gel, 31%)³ and increasingly more men are using facial products.⁴ Dermatologists should therefore ask men specifically about hair and facial products; familiarity with notorious allergens will help dermatologists troubleshoot prior to patch testing.

Occupations and Industries

Male participants with facial dermatitis were half as likely as MNoFD to have occupational-related skin disease; this is likely owing to the high frequency of occupational dermatitis on the hands/arms. A 2017 NACDG analysis¹⁵ of 2732 production workers found that 28.6% had facial involvement, considerably more

than nonproduction workers. Sources such as metallic dusts/powders and epoxy resins can easily become airborne or ectopically transfer to the face. Barrier protection may be beneficial in these cases.

Limitations

Limitations of this study include the retrospective analysis of referred patients for patch testing; exclusion of past/unknown relevance; narrow definition of facial involvement; and use of biologic sex rather than gender identity.

Conclusions

Over the past 20 years, primary facial involvement in male patients referred for patch testing has doubled. This may be owing to marketing of male-specific facial and hair products. It is important to inquire directly about hair dye and facial PCPs. Facial protection may help occupationally related FD. In cases of severe, worsening, or refractory male facial dermatitis, comprehensive patch testing may be necessary in this new metrosexual era.

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