

Olive oil – contact sensitizer or irritant?

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Adverse cutaneous reactions to topically applied olive oil are seldom reported, and positive patch tests to it are mostly regarded as allergic. To evaluate such "positive" patch test reactions, 77 female (mean age: 44 years) and 23 male eczema patients (mean age: 46 years) were prospectively patch tested with freshly prepared olive oil. Tests were performed openly (including ROAT) as well as using Al-tests® and Finn Chambers® on Scanpor®. 5 patients (2 male) showed "positive" test reactions (all patients at the Al-test® site, 3 at the Finn Chamber® site, 1 with ROAT). In only 1 patient could the reaction be classified as probably allergic, in contrast to previous reports. In conclusion, olive oil is very weakly irritant in general, but bears relevant irritant capacity when applied under occlusive conditions. Therefore, olive oil appears to be less than suitable for the topical therapy of patients with venous insufficiency and associated eczema of the lower extremities.

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Skin care for and treatment of patients with chronic dermatoses, especially atopic dermatitis and other chronic eczematous disorders, are often accompanied by problems resulting from adverse reactions to cream and ointment ingredients. Because olive oil (mixed glycerides of oleic, palmitic, linoleic, stearic and arachidic acids, squalene, phytosterol, tocopherol, phenolic compounds) (1) is considered to have little sensitizing or irritant potential (1, 2), and cutaneous reactions are seldom reported, this oil seems very suitable for skin care products. This is reflected by an increase in its topical use (3). Nevertheless, recent reports have drawn attention to allergic contact reactions when using olive oil for topical treatment (3-6), especially in patients with long-standing dermatoses and venous eczema. Critical review of these reports, and our own experience with about 1000 patients treated with ointments containing olive oil, prompted us to perform a prospective, patch-test-based study to explore "positive" patch test reactions regarding the irritant and sensitizing properties of topically applied olive oil.

Patients and Methods

100 patients with contact dermatitis were patch tested with the standard series and series of emulsi-

fiers, additives and vehicles of the DKG (German Contact Dermatitis Group) with Finn Chambers® under Scanpor® tape. Tests were applied for 2 days to the normal skin of the back. In addition, all patients were tested with freshly prepared pure olive oil. These tests were performed open (50 mm×50 mm area) as well as using Al-tests® (approx. 110 mm² test area, 50 µl olive oil), held in place with Micropore tape (3M, Minnesota, USA), and 8 mm Finn Chambers® (approx. 50 mm² test area, 20 µl olive oil) under Scanpor® tape (FCS; Hermal, Reinbeck, Germany) applied for 2 days, before removal for readings at 2 and 3 days. Reactions were recorded according to ICDRG recommendations (7), and results of altered response due to the angry back syndrome were excluded from analysis.

3 patients had used pure olive oil for skin care, and in 2 of them (patient nos. 1 and 4) it was suspected as being the causative agent of the underlying dermatitis. Olive-oil-containing ointments had been used by 7 patients (inc. patient no. 5), but in none of them did the application of the ointment appear to be of clinical relevance (different locations of the underlying dermatitis and the application site, absent subjective discomfort, etc.). In those patients with reactions to olive oil on patch testing and a non-self-explanatory clinical presen-

Table 1. Test results for 5 patients reacting to olive oil out of 100 (ROAT: repeated open application test)

Patient (no.)	Sex	Age (years)	Test diagnosis	Test results Finn Chamber® (D3)	Test results Al-test® D3	Secondary spread	ROAT or other use test
1	male	87	contact dermatitis of the lower legs (venous ulcers)	irritant (erythema, papules, pustules)	irritant (erythema, papules, pustules)	no	negative
2	male	30	atopic eczema with suspected contact dermatitis (hands)	negative	irritant (erythema, papules)	no	negative
3	female	46	contact allergy to adhesive plaster	negative	irritant (erythema, papules)	no	negative
4	female	30	contact dermatitis (hands)	allergic (erythema and papules)	allergic (erythema and papules)	yes	not performed
5	female	34	contact dermatitis (face)	irritant (erythema, papules, pustules; ring-shaped pattern)	irritant (erythema, papules, pustules; ring-shaped pattern)	no	erythema

tation, a repeated open application test (ROAT) was performed additionally with pure olive oil. It was applied 2× daily for 7 days to undamaged skin

of the flexor aspect of the forearm near the cubital fossa (8, 9).

Results

Patch tests were performed on 77 female (mean age: 44 years; range: 10–86 years) and 23 male (mean age: 46 years; range: 16–87 years) patients. Positive reactions to olive oil were seen in 3 female and 2 male patients (Table 1).

Patient no. 1: male patient (87 years) with chronic venous insufficiency and venous eczema: for about 2 years, skin care of the lower legs with pure olive oil under compressive therapy with bandages. Irritant contact dermatitis of the lower legs for about 2 weeks (Fig. 1). Crescendo patch test results (Al-test® and Finn Chamber®): erythema and papules at D2 reading (Fig. 2.), pustules additionally at D3 reading; skin at the application site of openly applied olive oil (Fig. 2) and ROAT was non-reactive. Other substances with positive (allergic) reactions: t-butylhydroquinone, framycetin. After therapy of the contact dermatitis, skin care with pure olive oil without occlusion showed no side-effects.

Patient no. 2: male patient (30 years) with known atopic eczema and suspected contact dermatitis of the hands. Erythema and papules at the application site of Al-test® at the D2 and D3 readings, non-reactive with Finn Chamber® (Fig. 3) and open test as well as ROAT. Others positive: thimerosal, propolis.

Patient no. 3: female patient (46 years) with suspected contact allergy to adhesive plaster. At the application site of Al-test® erythema at the D2 reading, and erythema as well as papules at the D3 reading; other tests (Finn Chamber®, open and ROAT) negative.

Patient no. 4: female professional beautician and



Fig. 1. Patient no. 1. Irritant contact eczema of the lower legs caused by olive oil, which had been applied under occlusive conditions (bandages).

Fig. 2. Patient no. 1. Patch test reactions at D3. Erythema, papules and pustules at the application site of Al-test[®] and Finn Chamber[®]. Open tests (upper arm) with olive oil were negative.



pedicurist (30 years), for 11 years with subacute contact dermatitis of both hands (spreading) while using an olive-oil-containing massage oil; erythema at the application site of Al-test[®] and Finn Chamber[®] at the D2 reading, erythema and papules (spreading) at the D3 reading, and erythema and papules in the open test (ROAT not performed) (Fig. 4). Others positive: nickel, neomycin, eugenol, clove oil, massage oil (constituents: almond oil, olive oil, wheat oil).

Patient no. 5: female patient (34 years, atopic) with erythematous irritant reaction for 4 weeks, after applying skin care products to the facial skin.

2 weeks before testing, the patient had used an olive-oil-containing ointment without aggravation of the facial dermatitis. Erythema, papules and pustules at the application site of Al-test[®] and Finn Chamber[®] at the D2 and D3 (ring-shaped pattern) readings, erythema on open testing as well as in the ROAT. Others positive (irritant): propylene glycol, octyl gallate.

Discussion

Reports of cutaneous reactions to topically applied olive oil are rare (3–6, 10, 11) and to date, less

Table 2. Data in the literature about patients reacting to olive oil (ROAT: repeated open application test)

Authors	No. patients (female/male)	Venous disorder with insufficiency, ulcer, eczema (female/male)	Other substances with positive reactions	Secondary spread	ROAT or other use test
Van Joost et al. (1981)	1/1	1/?	azo dyes, PPD, procaine, benzocaine, colophony, parabens, formaldehyde	not reported	not reported
De Boer & Van Ketel (1984)	1/1	not reported	no reaction	male patient with a dermatitis over whole body for 25 years	not reported
Jung & Holzegel (1987)	2/-	1	kanamycin, neomycin, parabens, colophony, formaldehyde	not reported	not reported
Padoan et al. (1990)	10/3	9/2	Amerchol L101, balsam of Peru, carba mix, cobalt, colophony, fragrance mix, lanolin, neomycin, thiuram mix	2 patients	1 patient (positive reaction)



Fig. 3. Patient no. 2. D3 reading: erythema and papules at the application site of Al-test®, non-reactive at the Finn Chamber® application site.



Fig. 4. Patient no. 4. Female professional cosmetician and pedicurist with erythema at the application site of Al-test® and Finn Chamber® and at the D2 reading, erythema and papules (spreading) at the D3 reading, and erythema and papules on open testing.

than 25 patients with contact reactions have been described. In the majority, the underlying mechanism has been thought to be sensitization (3–6), yet there are some doubts as to the conclusions drawn in the literature as to the sensitizing potential of olive oil, when critically reviewing such reports.

(i) Referring to all reported patch-test-positive patients ($n=19$), secondary spread of the underlying contact dermatitis was recorded for only 2 patients after topical use of olive oil.

(ii) No report describes crescendo reactions to the patch tests over the test period, only the results of the D3 reading being given (+ to ++++). At least 3 patients are described as having +++ or ++++ reactions (4, 6), which are rated in the literature as mostly representing irritation (12).

(iii) In 2 reports, 11 patients with positive reactions to olive oil were tested with all its known (5 patients) or major (6 patients) constituents, with negative outcomes (3, 6). To explain these contro-

versal results, Padoan et al. (3) proposed that might be "compound allergy" or allergy to components not yet identified. Nevertheless, following the explanations of Rietschel (13) makes the use of the term "compound allergy" in these cases dubious.

(iiii) According to the literature, open use tests and especially the ROAT should be performed initially in patients in whom little-known or new allergens are suspected to cause allergic contact dermatitis, and also to determine both irritant and allergic responses to substances producing reactions of which the allergic or irritant nature cannot be decided on the basis of the patch test results alone (8). However, in the above-mentioned reports, an open test (not further specified) was performed in only 1 patient (Table 2). The majority of patients reported with contact dermatitis due to the application of pure olive oil are described as suffering from venous insufficiency and eczema (3,

4, 6). Therefore, there is good reason to suppose that in most cases, the olive oil had been applied under occlusive conditions (bandages).

Although induced by different mechanisms, allergic and irritant contact dermatitis are remarkably similar on clinical, histologic, and immunophenotypical grounds (14–16), and this poses considerable problems in dermatologic practice when differentiating between allergic and irritant patch test reactions (16). Additionally, even extensive immunostaining of all relevant cell types does not allow discrimination between allergic and irritant patch test reactions by the time of their final reading (16).

The assessment of allergic and irritant contact dermatitis, as well as allergic and irritant patch test reactions, is supported by an adequate test procedure: construction details of the patch test units, such as size of absorbent material and quantity of applied test material, significantly influence the intensity of patch test reactions (17, 18), and we therefore decided to use both Al-tests[®] with a test area of approx. 110 mm² and Finn Chambers[®] with one of approx. 50 mm². Patient nos. 2 and 3 demonstrated at the Al-test[®] application site only erythematous and papular reactions without any clinical relevance (Fig. 3). The fine structure of the test reaction is stated to be the most important parameter (among criteria such as crescendo of the patch test reaction, spreading, and others) discriminating between allergic and irritant reactions (19), and irritant reactions to oils are known to be acneiform and pustular (14, 20). Patient nos. 1 and 5 reacted in this characteristic way.

Open tests and use tests like the ROAT are additionally recommended in patients in whom little-known or new allergens are suspected as being the cause of allergic contact dermatitis (8). Since patient no. 1 showed no reaction on open testing as well as in the ROAT, and because non-occlusive therapy with olive oil was well-tolerated, the patch test reaction was classified as irritant as in patient nos. 2 and 3. Only patient no. 5 had an erythematous open test, such that the underlying mechanism remains uncertain. Patient no. 4 showed crescendo reactions at the Finn Chamber[®] and Al-test[®] sites, her contact allergy had involved secondary spread, and the circumstances of using olive oil as a professional beautician and pedicurist gave more clinical relevance than a ROAT (therefore not performed). In conclusion, only patient no. 4 could be classified as probably having been sensitized to olive oil.

Following the definition of Berardesca & Distan-te (15) that irritant contact dermatitis is the clinical response of the skin to a variety of external

stimuli that induce skin inflammation without the production of specific antibodies, and having in mind that the use of irritant substances as test materials is undoubtedly the most common cause of false-“positive” reactions (12, 19), olive oil seems to be more a weak irritant than a contact sensitizer in the very rare cases of adverse reactions. But, with Padoan et al. (3), the conclusion must be that olive oil is less than suitable for skin care and topical therapy of patients with (long-standing) venous insufficiency and especially eczema (21), independent of the underlying mechanism of the adverse reaction.

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