Section: DVL

Original Research Article

INTERPRETATION OF PATCH TESTING AND FOLLOW-UP CARE IN ALLERGIC CONTACT DERMATITIS BY PATIENT ASSISTED TELEDERMATOLOGY PRACTICE- A SURVEY AND FEASIBILITY STUDY

Malavika M[1], Chethana S.G[2], Garehatty Rudrappa Kanthraj[2]

[1]*Assistant Professor, Department of Dermatology Venerology & Leprosy, Mount Zion Medical College, Adoor Pathanamthitta, Kerala, India*
[2]*Assistant Professor, Department of Dermatology Venerology & Leprosy, JSS Medical College hospital, JSS university, Mysore Karnataka, India*

Received *: 20/12/2025*
Received in revised form *: 06/02/2026*
Accepted *: 24/02/2026*

Corresponding Author:
Dr. Malavika M
Assistant Professor, Department of Dermatology Venerology& Leprosy, Mount zion Medical college, Adoor Pathanamthitta, Kerala, India
Email: malavika.madhusoodanan1990@gmail.com

DOI: 10.70034/ijmedph.2026.1.374

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (1); 2152-2156

ABSTRACT

Background: Allergic contact dermatitis (ACD) is common in dermatology clinics. Patch test interpretation demands multiple visits. Patient assisted teledermatology practice (PATP) involves capture, transfer of images and interaction with the dermatologist by the patient. The aim is to assess the acceptability and feasibility of PATP to interpret patch test in ACD.

Materials and Methods: ACD cases were divided into PATP or face to face (FF) based on survey (20 questionnaire model) after informed consent. In PATP, serial images were received by messenger apps for follow-up. Active ACD lesions were periodically assessed by EOL score (erythema (0-3), oozing (0-3) and lichenification (0-3)). Patch test was interpreted by ICDRG criteria at 48 hr, 96 hr and day 7. In FF, follow-up was performed in outpatient department. Quality of images received were graded as 1 – poor, 2 – fair, 3 – good and 4 – excellent. Patient (Likert's scale 0-4) and physician (image quality) satisfaction were analysed.

Results: A total of 194 cases participated. Direct enrolment for patch test (no active lesions of ACD)-169, treated for ACD however, did not undergo patch test-25. treated for ACD & underwent patch test-4. Independent sample t test revealed patient (0.068) and physician (0.115) satisfaction with 50% reduction in cost (0.683), time (0.710), distance (0.994) and sick leave (0.573) Quality of images received was significant (0.115 by t test). Patch test readings at 48 hrs (0.839), 96 hrs (0.872), Day 7(0.000) and common ICDRG grade 1+(0.336 in 78.7%) by Cramer's V test.

Conclusion: In PATP, there was 50 % reduction in follow up visits, cost, time, distance travelled and sick leave. PATP using messenger apps is feasible and acceptable for patch test interpretation.

Keywords: Allergic contact dermatitis; Patch test interpretation; Patient-assisted teledermatology practice; Teledermatology; Remote monitoring.

INTRODUCTION

Allergic Contact dermatitis (ACD) is a common problem encountered in dermatology clinics. ACD is a cell-mediated (type IV), delayed hypersensitivity reaction caused by skin contact with an environmental allergen. Patch tests are performed only after the active lesion have subsided following treatment.[1,2] Treatment followed by patch test and its interpretation for ACD demands several visits. Further it requires cost, waiting time and travel time for each visit. It will be a significant burden in geriatric and working community.[3,4]

The study and practice of dermatology using interactive audio, visual, and data communications from a distance is teledermatology.[5] The application of teledermatology tool (technology) to deliver dermatology care is called teledermatology practice. Teledermatology tool is an information technology platform to transmit clinical data between health care

professionals and patients and vice versa.[6] Active participation by patient along with dermatologists involves Patient Assisted Tele dermatology Practice (PATP) TP reduces frequent visits, travel, and waiting period and minimizes the treatment cost. It is important in elderly who suffer from chronic conditions.TP facilitates to pool expert opinions and helps in continuing medical education.[7]

A systematic survey on patient acceptability for teledermatology practice has not been conducted in India. Rural population is significantly greater in India with illiteracy and unemployment still proving a burden. There is no information available on mobile utility for medical practice. This study is planned to assess the feasibility of teledermatology application in the management of ACD.

MATERIALS AND METHODS

It was a Prospective interventional study which includes all patients with ACD attending Dermatology Outpatient Department, J.S.S Hospital, Mysore. Institutional Ethical Committee of JSS Hospital approved this study. Study was conducted from November 2016 to April 2018. All patients with ACD fulfilling inclusion criteria attending the outpatient department were included in this study.

Inclusion Criteria

All clinically suspected cases of ACD irrespective of age and sex. Patients willing to undergo patch test. Patients or his attendants using smart phone applications. Willing to give consent for tele dermatology practice

Exclusion Criteria

Patients who are not willing for the study. Patients who are not willing for follow-up. Patients on immunosuppressive therapy. Pregnancy and lactation. Patients who have systemic allergies like bronchial asthma.

Method of collection of data

A detailed history was noted with respect to the occupation, duration of disease, and previous treatment received. All the patients were subjected to general physical examination and cutaneous examinations. The site and distribution of lesions was recorded.

A study was designed to test feasibility to deliver follow-up care by PATP and interpretation of patch test results. Patients who have active lesions were treated by topical steroids and or antihistamines. Follow -up care was advised after 2 weeks. Patients were given option either FF or PATP or both modes of interpretation of serial patch test reading. Patients were asked to choose one of the follow-up methods. If active lesions were there it will be treated and assessed by Erythema, (E), oozing and (O)lichenification(L) - (EOL) score.

Clinically suspicious cases of ACD were treated as per Standard treatment protocol using topical steroids. Written informed consent was obtained for patients seeking PATP. In each follow-up visits the images were captured and transferred to the dermatologist using mobile messenger apps.

The therapeutic response in ACD was evaluated by serial EOL score every biweekly on a 0-3 scale as follows.

EOL score is calculated by the sum of erythema, oozing and lichenification multiplied by hundred i.e. (E+O+L) X 100. The EOL score will be noted periodically once in 2 weeks. If there was no or minimal improvement the treatment will be changed with a different steroid molecule and potency. Initial and the final EOL score will be noted. The difference in the initial and final follow-up EOL score represents the percentage of improvement. If there were any adverse effects the patient was asked to call and send the images immediately. Patients was treated till the active lesion subsided. Counselling and treatment will be advised with each PATP.

Patients were counselled about the advantages of PATP. In PATP patient attenders were trained to capture the image of patch test area on Day 4(96 hrs) and day 7(Late reactions) readings were noted in FF, PATP and cross over modes of interpretation of serial patch test reading. The reaction was read using the International Contact Dermatitis Research Group (ICDRG) criteria for all patients (table-3). The study methodology is summarised in figures.

Statistical Methods:

The Descriptives procedure displays univariate summary statistics for several variables in a single table and calculates standardized values (z scores). Variables can be ordered by the size of their means (in ascending or descending order), alphabetically, or by the order in which the researcher specifies. Following descriptive statistics were employed in the present study-mean, Standard deviation, frequency and percent and Chi-square and T-test were used for associations. $P<0.05$ is considered statistically significant. SPSS (25.0) was used for analysis.

RESULTS

The patients of age less than 30 years were 9.5% (9), 31.0% (27) and 8.3% (1%) in the face to face, PATP and cross over modes of interpretation of serial patch test reading respectively. Age greater than 30 years the patients were 90.5% (86), 69% (60), 91.7% (11) among the three modes of interpretation of serial patch test reading. (0.001 by Cramer's V) Males in face to face, PATP and cross over modes of interpretation of serial patch test reading were 47.3% (52), 48.2% (53) and 4.5% (5) respectively. Females were 50.6% (42), 41% (34) and 8.4% (7) among the three modes of interpretation of serial patch test reading respectively. Literates were 30.5% (29), 51.7%, (45) and 33.3% (4) in face to face, PATP and cross over modes of interpretation of serial patch test reading respectively. Illiterates were 69.5% (66), 48.3% (42) and 66.7% (8) among the three modes of interpretation of serial patch test reading respectively.

Table 1: Age, gender and literacy status distribution in Face to face, patient assisted teledermatology practice and cross over modes of interpretation of serial patch test reading

Modes of interpretation of serial patch test reading	Age*		Gender#		Literacy$	
	<30 yrs	>30 yrs	Male	Female	Literates	Illiterates
Face to face	9(9.5%)	86(90.5%)	52(47.3%)	42(50.6%)	29(30.5%	66(69.5%)
Patient assisted teledermatology practice	27(31.0%)	60(69%)	53(48.2%)	34(41%)	45(51.7%)	42(48.3%)
Cross over@	1(8.3%)	11(91.7%)	5(4.5%)	7(8.4%)	4(33.3%)	8(66.7%)

Table 2: Physician Satisfaction for Patient assisted teledermatology practice and Cross-over* modes of interpretation of serial patch test reading as per grading the quality of images

Quality of images	Patient assisted teledermatology practice	Cross-over@	Total
Grade 1-2(unsatisfactory)	38(45.8%)	9(75%)	47(49.5%)
Grade 3-4 (satisfactory)	45(54.2%)	3(25%)	48(50.5%)
Total	83(100%)	12(100%)	95(100%)

The quality of images grade 3-4 was high compared to grade 1-2 (.058 by Cramer's V test). The quality of images sent by literates was high compared to illiterates (0.013 by Cramer's V test). Details are summarized [Table] @ FF patients who chose PATP for one or more serial patch test readings *0.058 by Cramer's V tes Grade 1-poor, Grade 2-Fair, Grade 3-good, Grade 4- excellent.

Table 3: Erythema, oozing, lichenification (EOL) score comparison between Patient assisted te ledermatology & Cross over with Face to face:

Mode of follow-up care	No of patients	Erythema, Oozing, Lichenification score			
		Follow up visits			
		1	2	3	4
Face to Face	01	400	300	NA	NA
Patient assisted teledermatology practice	03	400	233.3	100	66.67
Cross over@	Nil	-	-	-	-

Among 194 patients 29 patients underwent assessment with EOL score. Patch testing. was subjected in 4 patients after active lesions subsided. Among the 4 patients, 3 patients chose PATP and 1 patient chose FF. Details are [Table 3]

Out of 169 patients, 38 patients showed a positive reading as per ICDRG criteria. There were 35 patients positive at 48 hrs (FF=11, PATP=21 & Cross over=3), 39 patients at 96 hrs (FF=14, PATP=22 & Cross over=3) and 38 patients at day 7 (FF=13, PATP=22 & Cross over=3). Details summarised in (Table13) Final day 7 readings were; 1+ reading in 7.89% (3) patients, 2+ reading in 81.57% (31) patients and 3+ reading in 13.15% (5) patients. Details summarised on (Table 14&Graph 8). Commonest allergen positivity was observed in paraphenylenediamine (n=23; 9(FF), 12(PATP), 2(Cross over)), parthenium (n=5; 2(FF), 2(PATP), 1(Cross over)) and nickel (n=3; 1(FF), 2(PATP). Among combinations, paraphenylenediamine and nitrofurazone (n=2: 2(PATP) was common. Details summarised in large table. Intercomparing the modes of interpretation of serial patch test reading at 48 hrs (0.839), 96 hrs (0.872) and day 7(0.000) was done by Cramer's V test.

Table 4(A): Pattern of patch test reading among Face to face and patient assisted teledermatology practice modes of interpretation of serial patch test reading

Patch test reading (ICDRG) International contact dermatitis research group	Modes of interpretation of serial patch test reading								
	Face to Face(n=76)			Patient assisted teledermatology practice(n=80)			Cross over@(n=12)		
	48* hrs	96# hrs	Day 7$	48* hrs	96# hrs	Day 7$	48* hrs	96# hrs	Day 7$
Paraphenyldiamine (PPD) (n =23)	7 (9.2%)	9 (11.8%)	9 (11.8%)	11 (13.6%)	12 (14.8%)	12 (14.8%)	2 (16.7%)	2 (16.7%)	2 (16.7%)
Parthenium (n = 5)	2(2.6%)	2 (2.6%)	2 (1.3%)	2 (2.5%)	2 (2.5%)	2 (2.5%)	1 (8.3%)	1 (8.3%)	1 (8.3%)
Nickel (n =3)	1(1.3%)	1(1.3%)	1(1.3%)	2(2.5%)	2(2.5%)	2(2.5%)	0	0	0
Fragrance mix (n =2)	0	0	0	2(2.5%)	2(2.5%)	2(2.5%)	0	0	0
Nitrofurazone (n =1)	1(1.3%)	1(1.3%)	1(1.3%)	0	0	0	0	0	0
Thiuram mix (n =1)	0	0	0	1(1.2%)	1(1.2%)	1(1.2%)	0	0	0
Black rubber mix (n =1)	0	0	0	1(1.2%)	1(1.2%)	1(1.2%)	0	0	0
PPD & Nitrofurazone (n =2)	0	0	0	2(2.5%)	2(2.5%)	2(2.5%)	0	0	0
Parthenium & black rubber mix (n =1)	1(1.3%)	1(1.3%)	-	0	-	-	0	0	0
Erythema on colophony site (n =1)		-							

Parthenium (doubtful reaction) (n =2)	2(2.6%)	-	-	0	-	-	0	0	0
Angry back (n =1)	1(1.3%)	-	-	0	-	-	0	0	0
Negative (n =131)	61 (80.3%)	62 (81.6%)	63 (82.9%)	60 (74.1%)	60 (74.1%)	59 (72.8%)	9 (75%)	9 (75%)	9 (75%)

Table 4 (B): Distribution of positive patch test pattern in various modes of interpretation of serial patch test reading

International Contact Dermatitis Research Group (ICDRG) Reading (Positive patch test)	Modes of interpretation of serial patch test reading			Total(n=38)
	Face to Face (n=13)	Patient assisted teledermatology practice (n=22)	Cross over@(n=3)	
1+	2(15.4%)	1(14.5%)	0(0%)	3(7.9%)
2+	9(69.2%)	18(81.8%)	3(100%)	30(78.9%)
3+	2(15.4%)	3(13.6%)	0(0%)	5(13.2%)
Total	13(100%)	22(100%)	3(100%)	38(100%)

0.687 by cramers v test

Table 5: Patient Satisfaction for Patient assisted teledermatology practice and Cross-over* groups as per modified Likert's scale

Score	Patient assisted teledermatology practice	Cross-over*	Total
0-1(Unsatisfactory)	0	0	0
2-4(Satisfactory)	83(100%)	12(100%)	95(100%)
Total	83(100%)	12(95%)	95(100%)

The overall patient satisfaction was 100% (95). In PATP and cross over modes of interpretation of serial patch test reading it was 100% (83), and 100% (12) respectively.

DISCUSSION

In our study, younger age less than 30 are more tech savvy therefore they were divided into age group less than 30 and more than 30 years. However, we observed there were more cases in age greater than 30 probably ACD involves older age group. Male preponderance was observed in our study. Females were in favour of FF than PATP due to reluctance in photographing the back. Males opted PATP compared FF modes of interpretation of serial patch test reading. Illiterates opted for FF and literates opted for PATP. Access to smart phones was meagre in FF modes of interpretation of serial patch test reading.

Sick leaves, convenience, cost benefits and access to internet were the prime reasons to choose PATP based modes of interpretation of serial patch test reading in our survey Similar findings were noticed by Hoffmann Wellenhoff et al8to monitor leg ulcers. Therefore, there were no intermediates between the patient and the dermatologist. It enables faster interpretation of serial images and treatment being conveyed reducing the delay. In FF, most patients had availability of internet services and access to smart phones but still chose FF based modes of interpretation of serial patch test reading probably due to doubt in technology or unwilling to photograph the back.[9]

Patch test was done after active lesion subsided. For the active lesions EOL score was calculated. Patient had to undergo initial visit to have reference image and initial EOL score and Final EOL score were FF to compare the previous EOL scores. This process improved the compliance, patient satisfaction and increased confidence in technology. Patch test procedure was not performed in 25 patients. Active lesions had subsided in two or three follow up visits and they postponed the procedure to a later date.[10]

One patient in PATP was negative for paraphenylenediamine at 48 hrs but became positive at 96 hrs. The 48 hrs, 96 hrs and day 7 readings with respect to PATP and FF in interpreting patch test results was comparable. Pattern of allergen positivity at day 7 between FF, PATP and cross over modes of interpretation of serial patch test reading was comparable and statistically significant. The 2+ reading (ICDRG) was found to be the majority in PATP and was comparable with FF modes of interpretation of serial patch test reading. The feasibility of PATP in interpretation of patch test reading (ICDRG) was comparable to FF in single allergen positivity, combined allergen positivity and serial ICDRG readings. Patch test allergen templates are placed over the back. The fixed site template served as an analogue to capture the serial images for the patient. Good quality images, counting the allergen over a fixed template made interpretation of patch test allergens easy, convenient and enhanced patient and physician satisfaction.[11]

Patient satisfaction was one of the important parameters we addressed in PATP. It was comparable to FF (gold standard) modes of interpretation of serial patch test reading (This may be due to the following reasons: (a) Average reduction in travel distance, travel cost, time (travel & waiting) with sick leaves incurred was 50% (b) There was 50% reduction in follow up visits compared to FF consultation (c) Travel to hospital can be minimised in senior citizens, patients with comorbidities or students and working community by choosing PATP modes of interpretation of serial patch test reading. Convenience and easy to use technology made FF patients to opt for PATP (cross over modes of interpretation of serial patch test reading). One of our patients who presented to us from 300kms from our place underwent patch testing and all the readings

(48hrs, 96hrs and day 7) were interpreted by PATP.[12]

Randomisation and comparison between FF and PATP modes of interpreting serial patch test reading to validate it, was not performed. In teledermatology studies this is not possible unless the same patient is assessed in OPD by two different dermatologists; one interprets patch test clinically and the other using the image.

Limitations

We observed the following limitations in this survey and study:

1. Randomisation with respect to face to face and patient assisted teledermatology practice was not done in sampling. It was allocated based on patient choice.
2. Quality of images received varied as patients used their own smart phones for capture and transfer.

CONCLUSION

PATP using messenger apps is feasible and acceptable mode of interpretation for serial patch test readings. The quality of images received from patients was good and can be used for serial patch test interpretation. Physician and patient satisfaction in PATP were same as FF mode of serial patch test readings. In PATP, there was 50 % reduction in follow up visits, cost, time, distance travelled and sick leaves.

REFERENCES

1. Nelson JL, Mowad CM. Allergic Contact Dermatitis. J Clin Aesthetic Dermatol 2010;3:36–41.
2. Garner LA. Contact dermatitis to metals. Dermatol Ther. 2004;17(4):321–7.
3. Moennich JN, Zirwas M, Jacob SE. Nickel-induced facial dermatitis: adolescents beware of the cell phone. Cutis. 2009;84(4):199–200.
4. Thyssen JP, Milting K, Bregnhøj A, Søsted H, Duus Johansen J, Menné T. Nickel allergy in patch-tested female hairdressers and assessment of nickel release from hairdressers' scissors and crochet hooks. Contact Dermatitis. 2009;61:281–6.
5. Perednia DA, Brown NA. Teledermatology: one application of telemedicine. Bull Med Libr Assoc. 1995;83:42–7.
6. Kanthraj GR. Classification and design of teledermatology practice: what dermatoses? Which technology to apply? J Eur Acad Dermatol Venereol JEADV. 2009;23:865–75.
7. Eedy DJ, Wootton R. Teledermatology: a review. Br J Dermatol. 2001;144:696–707.
8. Hofmann-Wellenhof R, Salmhofer W, Binder B, Okcu A, Kerl H, Soyer HP. Feasibility and acceptance of telemedicine for wound care in patients with chronic leg ulcers. J Telemed Telecare. 2006;12:15–7.
9. Braun RP, Vecchietti JL, Thomas L, Prins C, French LE, Gewirtzman AJ, et al. Telemedical wound care using a new generation of mobile telephones: a feasibility study. Arch Dermatol. 2005; 141:254–8.
10. Kanthraj GR, Srinivas CR, Shenoi SD, Deshmukh RP, Suresh B. Comparison of computer-aided design and rule of nines methods in the evaluation of the extent of body involvement in cutaneous lesions. Arch Dermatol. 1997;133:922-923.
11. Kanthraj GR, Srinivas CR, Shenoi SD, Suresh B, Ravikumar BC, Deshmukh RP. Wound measurement by computer-aided design (CAD): a practical approach for software utility. Int J Dermatol. 1998; 37:714–5.
12. Kanthraj GR. Patient-assisted teledermatology practice: what is it? When, where, and how it is applied? Indian J Dermatol Venereol Leprol. 2015; 81:136–43.