ORIGINAL ARTICLE

Physical urticaria: prevalence, type and natural course in a tropical country

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Abstract

Background Physical urticarias (PU) are an urticarial response to different specific physical stimuli. PU can occur concurrently with chronic spontaneous urticaria or another type of PU.

Objective We aimed to study the prevalence, type, clinical data and natural course of each type of PU and other inducible urticarias and also the prognostic factors for remission of patients visiting a tertiary referral hospital.

Method We performed a retrospective study of 1200 chronic urticaria patients who visited our Urticaria Clinic during a period of 5 years.

Results Of the 1200 chronic urticaria patients, 86 (7.2%) were diagnosed as PU and other inducible urticarias. The most common type of PU was symptomatic dermographism (n = 35, 40.7%) followed by cold urticaria (n = 20, 23.3%) and delayed pressure urticaria (n = 11, 12.8%), respectively. Twelve patients (13.9%) had associated chronic spontaneous urticaria. None of the cases had multiple types of PU. Erythrocyte sedimentary rate elevation was the most common abnormal laboratory result. Nevertheless, only 4.6% declared a related infection. For each type, the median time after onset before 50% remission showed that cholinergic urticaria took the shortest course (34 months) and delayed pressure urticaria took the longest period (110 months). After 1 year and 5 years from the onset of symptoms, 13% and 50% of PU patients were free of symptoms, respectively.

Conclusion This study emphasized the variety of PU, other inducible urticarias and natural courses based on tertiary hospital care. PU and other inducible urticarias have tendency to have a longer course than chronic spontaneous urticaria.

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Keywords

natural course, physical urticaria, prevalence, type

Conflicts of interest

Authors have neither conflict of interests nor financial support from/related to any drug companies.

Introduction

Urticaria is characterized by transient weal and flare due to leakage of plasma into dermis and axonal reflexes, respectively. Urticaria is caused by various factors. Chronic spontaneous urticaria refers to recurrent urticaria occurring at least 6 weeks and not provoked by physical stimuli, skin contact or small vessel vasculitis.[1,2] Physical urticarias (PU) are defined as urticarial response to different specific physical stimuli, which include cold contact urticaria, symptomatic dermographism, heat contact urticaria, solar urticaria, delayed pressure urticaria (DPU) and vibratory urticaria/angio-oedema. Other inducible urticarias include cholinergic urticaria, aquagenic urticaria, contact urticaria and exercise-induced urticaria/anaphylaxis.[3] The latter group is not induced by a direct exogenous physical trigger on the skin. Both groups may present with weal and/or angio-oedema or rarely, anaphylaxis. At the present time, no definite mechanism can elucidate causes. However, neoantigens from physical stimulus leading to mast cell degranulation via IgE (type I immune response) are hypothesized as the most probable cause.[4] The prevalence of PU in adults varies from 20% to 30% amongst cases of urticaria[5] and 6.2–25.5% with children.[6,7] PU can occur concurrently with chronic spontaneous urticaria or another type of PU.[8] In some cases of PU, underlying diseases or associated clinical conditions are likely to be found.[9] In addition, due to the inevitable physical stimuli of everyday conditions, those with PU seem to have a diminished quality of life.[10] Presently, there are limited data regarding the natural course of PU. In this study, we aim to contemplate the prevalence, type, clinical data and natural course of each type of PU and other inducible urticarias as well as to prognostic factors for remission of patients visiting a tertiary referral hospital.

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Materials and methods

This study was approved by Siriraj Institutional Review Board, Siriraj Hospital, Mahidol University, Bangkok, Thailand. We retrospectively reviewed patients' (above 18 years old) case-recorded forms with a diagnosis of chronic urticaria in the Urticaria Clinic, Department of Dermatology, Siriraj Hospital from January 2003 to December 2008. The collected data included in its scope were demographic data (age, gender), causes of urticaria, associated diseases, physical examination results, laboratory investigations, duration and results of treatments.

To identify PU and other inducible urticarias cases, the standard tests were conducted to categorize type. Dermographometer (pressure at 4900 g/cm^2) was the method applied to produce itchy weal and flare after stroking at the forearm,[11] whilst testing for DPU; we placed sandbags weighing 15 lbs each over one shoulder for 15 min.[12] Weal or swelling at the site of application could be detected 2–8 h later. For identification of cold urticaria, ice-cubes placed inside a plastic bag were located on the forearm for 10 min,[13] which caused wealing to occur within 15 min after the skin got warm again. In cholinergic urticaria, the patients continued to run whilst being stationary until they were exhausted and sweaty.[14] A subsequent pruritic erythematous punctate weal occurring within 5–15 min was determined as a positive result. Adrenergic urticaria was assessed by intradermal injection with noradrenaline (3–10 ng in 0.02 mL saline),[15] and a small erythematous papule with halo of blanched skin was defined as positive. In solar urticaria, we performed photo tests with visible light, ultraviolet (UV) A and UVB.[16] Other laboratory investigations comprised complete blood count, urinalysis, erythrocyte sedimentary rate (ESR), stool examination and additional investigations as appropriate to each type of PU. These tests were for antinuclear antibodies (ANA), cryoglobulins, cryofibrinogen, hepatitis B surface antigen (HBsAg), hepatitis C virus antibody (anti-HCV Ab) and Venereal Disease Research Laboratory test.

For each follow-up period, we inquired about severity of symptoms and response to medication given as experienced by the patients. Remission of diseases was defined as non-urticarial weal for at least 6 months after abandonment of a medication and negative tests for PU. The course of disease was calculated from the onset to the remission.

Statistical analysis

Descriptive statistics (e.g., mean, median, minimum, maximum, frequencies and percentages) were applied to describe demographic data, prevalence and type of PU and other inducible urticarias and laboratory findings. Fisher's exact test and Mann–Whitney *U*-test were performed in univariate analysis with remission and non-remission groups. Since some patients were lost to follow-up, Kaplan–Meier survival curve was applied to determine the probability of symptom resolution at various time frames. SPSS for Windows version 10 (SPSS, Chicago, IL, USA) performed the tests to analyse all statistical data.

Table 1 Demographic data of patients with physical urticaria and other inducible urticarias (n = 86)

Characteristics	*n* (%)
Gender	
Male	22 (25.6)
Female	64 (74.4)
Physical urticaria (PU)	
Symptomatic dermographism	35 (40.7)
Cold urticaria	20 (23.3)
Delayed pressure urticaria	11 (12.8)
Adrenergic urticaria	9 (10.5)
Solar urticaria	4 (4.7)
Other inducible urticarias	
Cholinergic urticaria	6 (7)
Aquagenic urticaria	1 (1.2)
Association with chronic spontaneous urticaria	12 (13.9)
Multiple PU	0 (0)
Angio-oedema	17 (19.8)
Anaphylaxis	0 (0)
Personal history of atopy	24 (27.9)
Allergic rhinitis	20 (23.3)
Asthma	3 (3.5)
Allergic conjunctivitis	1 (1.2)

Results

Out of the 1200 chronic urticaria patients who visited our special clinic during the 5-year-period, 86 (7.2%) were diagnosed with PU and other inducible urticarias. Table 1 shows studied patients' demographic details. These were 22 men (25.6%) and 64 women (74.4%). The average age was 36.7 years (range 16–66 years). Fifty-five percentage of 1200 cases of urticaria had dermographism. However, out of 86 PU and other inducible urticaria patients, 35 cases (40.7%) had pure symptomatic dermographism which was the most common type of PU. The second and third most common causes were cold urticaria (n = 20, 23.3%) and DPU (n = 11, 12.8%), respectively. Twelve patients (13.9%) were associated with chronic spontaneous urticaria. None of the cases had multiple type of PU. Seven patients (19.8%) had angio-oedema, however, no anaphylaxis symptoms were detected. Twenty-four patients (27.9%) had personal history of atopy, including the most common which was allergic rhinitis (23.3%). Most patients (97.7%) had no abnormalities upon physical examination.

Several associated findings were detected in patients with PU. In symptomatic dermographism (SD), infection (34.3%, i.e. dental caries, positive HBsAg and upper respiratory tract infection), dyspepsia (uncomfortable stomach pains when following the usual diet) (14.3%) and diabetes mellitus (2.9%) were noted. However, only one case appeared to be a possible cause, which was diagnosed as carcinoma of the sigmoid colon. After receiving chemotherapy, the symptoms subsided and she required a lower dosage

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of antihistamine. With regards to cold urticaria, infection was the most common associated finding.

Regarding the four cases of solar urticaria, three cases were induced by visible light and one case was induced by visible light and UVA. Passive and reverse passive transfer tests were not performed. One patient received high dose of oral antihistamine (cetirizine, fexofenadine), psoralen and UVA light (PUVA). Despite this, symptoms did not improve. Finally, plasmapheresis was administered with positive results. Aquagenic urticaria was detected in only one case. An 18-year-old healthy woman was presented with a 2-year history of urticaria after having contacts with water. She developed a weal at the perifollicular area 5–10 min after being exposed to water. She received cetirizine for 1 month and the weal was absent during follow-up.

Erythrocyte sedimentary rate elevation was the most common abnormal laboratory result. Nevertheless, only 4.6% declared with a related infection. In cold urticaria, cold agglutinin was mainly found at a low titre, however, no systemic disease was detected. Positive ANA (low titre) was found at a rate of 10% and no case of connective tissue diseases was detected.

Most of our patients responded well with daily dosage of H-1 antihistamine and some patients responded to twofold dosage. In recalcitrant cases, none of the patients received a fourfold dosage; however, either other type of H-1 antihistamine or other treatment options were combined instead. In cold urticaria, cyproheptadine was our favourite option due to a socioeconomic problem; however, the most common side effect was drowsiness. However, some patients receiving desloratadine showed good results without any increase to a fourfold dosage. Recalcitrant cases of DPU needed supplement medications, such as, prednisolone, colchicine, sulfasalazine and chloroquine. Aside from antihistamine, additional prescriptions included propranolol, which was beneficial for adrenergic urticaria. The probability of remission is shown in Table 2. After 1 year and 5 years from the onset of symptoms, 13% and 50% of PU and cholinergic urticaria patients, respectively, recovered from symptoms (Fig. 1). According to the possibility of 50% remission, we used median time after onset to 50% remission, which means the median duration the patient took to achieve 50% remission for the symptom of urticaria. We obtained this value from the Kaplan–Meier survival curve (Fig. 2) by drawing the line starting from 0.5 probability of remission (*y*-axis) to meet each curve of PU and cholinergic urticaria; the course (months) was the result. For each type, the median time after onset before 50% remission showed that cholinergic urticaria took the shortest course (34 months) followed by cold urticaria (40 months), symptomatic dermographism (60 months) and adrenergic urticaria (65 months). DPU took the longest period (110 months) (Table 2, Fig. 2).

For survival analysis, the cohort was divided into remission and non-remission groups, in which remission was defined as an absence of triggered weal for at least 6 months after abandonment of medication and a negative test for PU. The course of disease

Table 2 Natural course, associated findings and laboratory results of various types of physical urticaria and cholinergic urticaria

	Symptomatic dermographism (*n* = 35)	Cold urticaria (*n* = 20)	Delayed pressure urticaria (*n* = 11)	Adrenergic urticaria (*n* = 9)	Cholinergic urticaria† (*n* = 6)
Association with chronic spontaneous urticaria, *n* (%)	0 (0)*	3 (15)	4 (45.5)	3 (33.3)	2 (33.3)
Associated findings/possible cause, *n* (%)					
Infection	12 (34.3)	8 (40)	2 (18)	1 (11.1)	1 (16.6)
Dental caries	10 (28.6)	7 (35)	2 (18)	1 (11.1)	1 (16.6)
Hepatitis B	1 (2.9)	1 (5)	0 (0)	0 (0)	0 (0)
URI	1 (2.9)	0 (0)	0 (0)	0 (0)	0 (0)
Dyspepsia	5 (14.3)	3 (15)	2 (18)	2 (22.2)	1 (16.6)
Diabetes mellitus	1 (2.9)	0 (0)	2 (18)	0 (0)	0 (0)
Other systemic diseases	1 (2.9)	1 (5)	0 (0)	0 (0)	0 (0)
Abnormal laboratory investigation, *n* (%)					
ESR, >20 mm/h	6 (17.1)	3 (15)	2 (18.1)	1 (11.1)	2 (33.3)
Eosinophilia, >1500 cell/mm^3	2 (5.7)	2 (10)	1 (9)	0 (0)	0 (0)
Positive ANA	3 (8.6)	2 (10)	1 (9)	1 (11.1)	0 (0)
Positive HbsAg	2 (5.7)	1 (5)	0 (0)	0 (0)	0 (0)
Positive cold agglutinin	0 (0)	8 (40)	0 (0)	0 (0)	0 (0)
Positive cryoglobulin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Median time after onset before 50% remission (months)	60	40	110	65	34

*Not included: dermographism that occurred in the course of patients with chronic spontaneous urticaria.

†Other inducible urticaria.

ANA, antinuclear antibodies; ESR, erythrocyte sedimentary rate; HbsAg, hepatitis B surface antigen; URI, upper respiratory tract infection.

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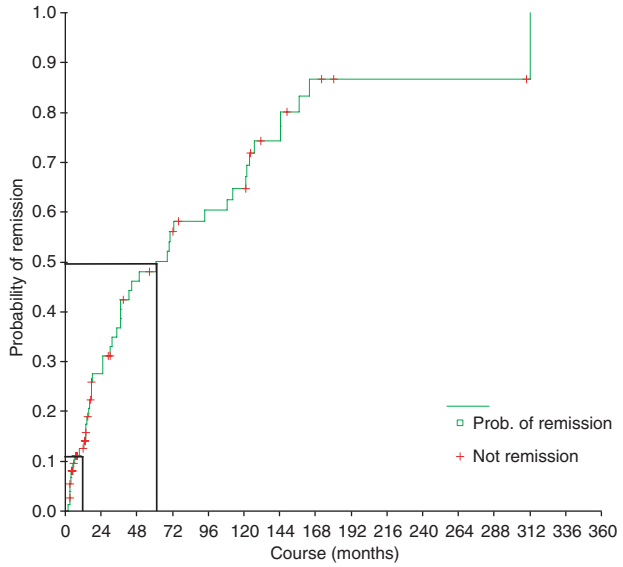


Figure 1 A Kaplan–Meier survival analysis (One Minus survival function) demonstrates the duration of disease in physical urticaria and cholinergic urticaria patients (n = 86). After 12 months (1 year) and 60 months (5 years) from the onset of symptoms, 12.5% and 50% of patients, respectively, recovered from symptoms.

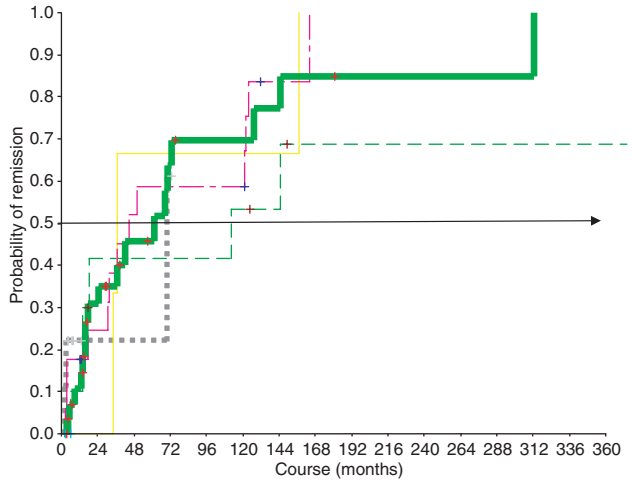


Figure 2 A Kaplan–Meier survival analysis (One Minus survival function) demonstrates course of diseases in each type of physical urticaria (PU) and cholinergic urticaria. From the line starting at a rate of 0.5 probability of remission y-axis to meet each the curve of PU showed that PU and cholinergic urticaria patients can achieve 50% remission in different duration (months). Cholinergic urticaria took the shortest course (34 months) followed by cold urticaria (40 months), symptomatic dermographism (60 months), adrenergic urticaria (65 months) and delayed pressure urticaria took the longest course (110 months). (▬) SD: 60; (—) Cholinergic urticaria: 34; (▪ ▪) Adrenergic urticaria: 65; (– –) Delayed pressure urticaria: 110; (–·–) Cold urticaria: 40.

Table 3 Univariate analysis between remission and non-remission groups of physical urticaria and cholinergic urticaria

	Remission group (n = 46)	Non-remission group (n = 29)	P-value
Gender			
Male	10	11	0.18*
Female	36	18	
Episode of PU and cholinergic urticaria before treatment (months): median (min, max)	37.7 (0.25–300)	38.5 (1–2400)	0.87†
Type of PU and cholinergic urticaria (no. patients)			0.34*
Symptomatic dermographism	18	12	
Cold urticaria	13	4	
Delayed pressure urticaria	6	4	
Adrenergic urticaria	3	6	
Cholinergic urticaria	3	2	
Personal history of atopy; n (%)	12 (26.1)	7 (24.1)	1.0*
Angio-oedema; n (%)	11 (23.9)	4 (13.8)	0.38*
Systemic diseases; n (%)	5 (10.9)	5 (17.2)	0.49*
Course of treatment (months): median (min, max)	39.5 (1.97–321.53)	35.6 (3–2469)	0.45†

*Fisher's exact test.

†Mann–Whitney U-test.

was calculated from the onset to the remission. Data from the remission and non-remission groups are summarized in Table 3. We found no statistically significant differences in any parameters including gender, type of PU, atopy history, angio-oedema, systemic diseases and course of treatment.

Discussion

Regarding the prevalence, 7.2% of our patients had PU and other inducible urticarias, which was less than in other studies (19–30%).[5,17] This result could be a consequence of some types, such as SD, being defined as a mild condition, easily diagnosed and not requiring a referral to tertiary care. SD was the most frequent type (40.7%) of PU. The utmost prevalence of SD could be due to simple investigation and diagnosis. Kozel *et al.* reported that of 220 urticaria patients, 33.2% had PU and 10.9% had PU combined with chronic idiopathic urticaria. Amongst the PU and other inducible urticarias group, SD was the most common (16.8%)[10] with our patients, 13.9% of PU and other inducible urticarias cases were associated with chronic spontaneous urticaria. It should be stipulated that we focused this study on patients with PU. We excluded patients with chronic spontaneous urticaria and dermographism during the course of their spontaneous urticaria. We intended to study patients with symptomatic dermographism, not those with chronic urticaria and dermographism.

A few studies reported a number of patients affected by multiple PUs, in which SD is often associated with other PU types.[8,18] Albeit, none of our cases had this condition. Angio-oedema was

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detected in 19.8% of our cases, and no prevalence data have been established. It should be noted that anaphylaxis cases may attend another department instead of the dermatology department outpatient clinic. The relationship between PU, other inducible urticarias and atopy are still controversial. One previous study in Thai healthy subjects showed that the prevalence of allergic rhinitis was 26.3%.[19] Our study found 23.3% of allergic rhinitis in PU and other inducible urticarias. This implies that there is no increase in prevalence of atopy in our PU when compared with other inducible urticaria patients.

In SD, many underlying conditions are supposed to be the trigger factors. Taskapan *et al.* reported that amongst 40 SD patients, psychic factors, scabies and drug reactions played important roles. However, atopy, hyperthyroidism, diabetes mellitus, menopause and glomerulonephritis seemed unrelated to SD.[9] Based on our study, infection, dyspepsia and diabetes mellitus seemed to be a coincidence. No related psychological factors were found. One of our patients was presumed to have SD related to carcinoma of the sigmoid colon since both conditions occurred simultaneously. After chemotherapy, SD improved and she required a lower dose of antihistamine.

We found acquired cold urticaria (ACU) was the second most frequent cause (23.3%), compared to cholinergic urticaria (7%) and solar urticaria (4.7%). Prevalence of cold urticaria is variously reported as between 5.2% and 33.8%, depending on geographical regions.[20] Katsaroa-Katsari *et al.* reported in a tertiary hospital in Athens, Greece that 27% of patients with PU were ACU.[21] Moreno and Harfi reported only two cases of cold urticaria in a tertiary centre in Saudi Arabia.[22] Interestingly, our hospital is situated in the tropics, and the latitude here seems to induce a tendency to develop heat-induced urticaria, such as cholinergic urticaria, over cold urticaria. It is probable that cholinergic urticaria is seldom referred to tertiary Care-centres. At the present time we have inadequate data to support this belief. Duke suggested that changes in temperature, rather than constant temperature, seem to be the controlling factor in cold urticaria. Cold hypersensitive patients have urticaria when previously exposed to heat. Thus, cold urticaria should be more frequent during summer months.[23]

Primary ACU comprises 96% of the patients with cold urticaria.[24] In some patients, cold urticaria is secondary to the underlying conditions, for instance: infection (measles, human immunodeficiency virus, hepatitis, infectious mononucleosis, *Mycoplasma* pneumonia and syphilis), cryoglobulinemia, cryofibrinogens and autoimmune diseases.[25] In our cases, laboratory tests revealed elevated ESR and positive ANA, cold agglutinin and HBsAg. However, neither autoimmune diseases nor cryoglobulinemia were found. One patient with positive HBsAg showed no hepatitis symptoms.

Delayed pressure urticaria usually occurs in a long standing pressured area such as hands, buttocks and shoulders. It has a latency period from 2 to 8 h. Barlow *et al.* found 37% of DPU was combined with chronic spontaneous urticaria.[26] During our study, prevalence of DPU was 12.8%. In this group, 45.5% was associated with chronic spontaneous urticaria, which was the highest association amongst subtypes of PU and chronic spontaneous urticaria. The pathogenesis of DPU remains unknown but increased levels of interleukin (IL)-6, TNF-α and IL-3 have been found.[27] DPU is usually recalcitrant to treatment. Various medications such as dapsone, sulfasalazine, montelukast, intravenous immunoglobulin and anti-TNF-α were reported advantageous in some cases.[28] Kulthanan *et al.* report one recalcitrant DPU case which benefited from chloroquine.[29]

Adrenergic urticaria is a rare type of stress-induced PU characterized by erythematous weals and typically surrounded by a striking white halo of vasoconstriction, as well as by a positive response to intradermal adrenaline or noradrenaline injections. Beta adrenoreceptor blocker (propranolol) has been reported successfully as a treatment, whilst atenolol has not. Also, antihistamine has been beneficial in some cases.[30] Our six patients responded to propranolol. In general, information on its natural course has limited data. In this study, adrenergic urticaria had the shortest course of diseases.

Cholinergic urticaria had been hypothesized to arise as a result from stimulation of the cholinergic postganglionic sympathetic nerve that supplies the sweat gland.[31] However, this can affect patients with anhidrosis or hypohidrosis.[32] This usually occurs with 16–35 year-old patients. Previously, combined cold and heat-induced cholinergic urticaria have been reported.[33]

Little is known about the natural course of PU and other inducible urticarias. Kozel *et al.* reported 16% of 73 patients with PU had remission in a year compared to 47% of 78 patients with chronic urticaria and/or angio-oedema.[10] Kulthanan *et al.* reported 34.5% of chronic idiopathic urticaria patients recovered from symptoms in a year.[34] Katsarou-Katsari *et al.* performed a study on 62 patients with ACU, the mean disease duration with patients having full recovery was 5.6 years and the disease was resolved in 18% and 35% of these within 5 years and 10 years, respectively.[21] According to the Kaplan–Meier curve, 13% and 50% of overall PU and cholinergic urticaria cases recovered from symptoms in 1 year and 5 years, respectively. Classified by each type, the median time after treatment to 50% remission in DPU took the longest period, 110 months, and cholinergic urticaria took the shortest course, 34 months. These data seem to indicate that when compared with chronic urticaria, PU and cholinergic urticaria have a worse prognosis. Univariate analysis between the remission and non-remission groups of PU indicated that there was no significant difference in any parameters between these two groups.

In conclusion, PU and other inducible urticarias seem to be a common condition about which the diagnosis is straightforward. They have a tendency to take a longer course than chronic spontaneous urticaria. This study emphasized the variety of PU and other inducible urticarias types and their natural courses based on tertiary hospital care.

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