True palmar pattern in vitiligo - A case control study

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ABSTRACT

Characteristic epidermal ridges formed on the finger pad and on the palm by the end of the second trimester and remain unchanged thereafter and those are responsible for the highly specific finger prints of each individual. These ridges are nither influenced by later prenatal period nor they subject to any influence in the postnatal environmental factors because the formation of ridge patterns gets already completed by about the eighteenth week of gestation. Dermatoglyphics is a scientific study of such epidermal ridges. Dermatoglyphic study of both palms of clinically diagnosed vitiligo patients and control subjects were carried out and statisticaltly analysed in respect to sex and side of hands. The study revealed variable number of deviations of this patterns in Vitiligo patients when compared with that of control. Increased number of true palmar patterns in right hypothenar, right thenar and both inter digital areas 2 (ID-2) and decreased TPP in Rt. ID3, Rt. ID4 in vitiligo male patients and increased TPP in Rt. Hypothenar and Rt. ID1 and decreased TPP in Rt. ID2 and Lt. ID 3 in vitiligo female patients while compared with that of the control group. Some of the variations observed were stastically significant.

Keywords: Dermatoglyphics, leucoderma, vitiligo, true plamer pattern.

INTRODUCTION

The surfaces of the epidermis are marked by elevations and depressions which are most prominent on the palms and the ventral surfaces of the fingers and on the corresponding surfaces of the feet. The elevations form characteristic epidermal ridges that are responsible for the highly specific finger prints of each individual. Scientific study of epidermal ridges and their configuration on the volar aspect of hands, fingers, feet and toes is called dermatoglyphics.[1]

The term dermatoglyphics has its origin from Greek words, Derma means skin and glyphic means carvings. Initially the term dermatoglyphics signified study of ridges only but subsequently the study of flexure creases of hands, soles, fingers, toes and other secondary folds were included in it.[2]

Dermatoglyphic patterns are not influenced by age or by postnatal environmental factors. Nor are they subject to any influences in the later prenatal period because the formation of ridge patterns is already completed by about the eighteenth week of gestation.[3] Dermatoglyphic patterns form on the finger pad and on the palm by the end of the second trimester and remain unchanged thereafter.[4]

There are many diseases known to be caused by the abnormal genes. Whenever there is any abnormality in the genetic make up of parents, it is inherited by the children and reflected in dermatoglyphic pattern. Hence the study of dermatoglyphics had been proven to be of great use in predicting the possibility of inheriting hereditary disease in patients.[5,6]

The epidermal ridges that produce typical patterns on the surface of the fingertips, palms of the hand and soles of the feet are genetically determined. They form the basis for dermatoglyphic studies in medical genetics and criminal investigations.[7] Application of Dermatoglyphics in genetics is chiefly because of its diagnostic value .In genetics it is used as a supportive investigation for definite diagnosis.[8]

This had stimulated many workers to study dermatoglyphics in various diseases, which provides a simple and inexpensive investigative means for determining whether the given patient has any particular chromosomal defect or not. Study of dermatoglyphics is thus valuable research tool in the field of Human genetics, forensics sciences, medicine and anthropology. It is assumed that genes take place in the development of dermal ridges and any gene predisposition to a familial disorder will alter dermatoglyphic patterns.[9]

Leucoderma is the general term applied to decreased melanin pigmentation of skin. Vitiligo is the commonest type of leucoderma. The disease is characterised by the loss of normal colour of skin in patches, greatly in extent, resulting into cosmetic disfigurement. Inherited pigment

Table-1: Percentage distribution of TPP in different palmar areas among control male and vitiligo male of right side

Subject & sex	Rt**Hyp TPP%**	Rt **Th TPP%**	Rt **ID1 TPP%**	Rt **ID2 TPP%**	Rt**ID3 TPP%**	Rt **ID4 TPP%**
CM	20	0	0	10.9	54.5	56.3
VM	25.4	5.8	0	13.7	54	50.9

disorders in human are known to involve mutations in gene which control various steps in pigmentary process. The inherinence of vitiligo by variable penetrance of an autusomal dominant gene of variable penetrance. Between 30 and 40% of patients have a positive family history and a genetic factor definitely involved.[10] In general mutations which interfere with development and migration of melenoblasts to peripheral sites are often associated clinically with localized hypo pigmentation. *Bleehen* and *Ebling*[11] stated that vitiligo may be inherited as an autosomal dominant trait without any sex predomination.

AIMS AND OBJECTIVES

1. To study the palmar dermatoglyphic patterns in vitiligo patients and normal person.
2. To compare dermatoglyphic configurations of both vitiligo patients with that of normal population.

MATERIALS AND METHODS

The present study was carried in Maharastra, Vidharb region from 2004 to 2006 comprised of 216 subjects. The study population consisted of clinically diagnosed cases of vitiligo (112). The controls (104) were students, doctors, nursing staffs, and paramedical staffs. Control group were all medically examined and were classified as healthy and free of any genetic or other skin disorders. Any other hereditary disease known to be responsible for variation in dermatoglyphic traits was also ruled out in controls.

Method of Dermatoglyphic printing: Dermatoglyphic prints were taken by the 'INK METHOD' of Cummins and Midlo [12]. Informed consent of the patients were taken. In case of a minor signature of parents/guardian were obtained. Handprints of palmar surface were taken on paper after smearing hands with ink. Later on, the paper sheets with handprints were coded with name and subjected for detailed palmar dermatoglyphic analysis with the help of magnifying hand lens and ridge counting with help of sharp needle. Results were entried in dermatoglyphic data sheet.

Table-3: Percentage distribution of TPP in different palmar areas among control female and vitiligo female of right side

Subject & sex	Rt**Hyp TPP%**	Rt **Th TPP%**	Rt **ID1 TPP%**	Rt **ID2 TPP%**	Rt**ID3 TPP%**	Rt **ID4 TPP%**
CF	*22.4*	6.1	0	12.2	57.1	55.1
VF	36	1.6	1.6	0	50.8	44.2

Detail steps of the printing method:

1) Palm prints were taken by the INK METHOD of Cummins and Midlo[12] in both hands.
2) The palm was examined for the uniformity of the ink, if found otherwise then the person was subjected to rewash of hands and to avoid further nonuniformity of inking the following method was practiced: - First a thin film of ink was made in same way but on the smooth outer convex surface of a metallic oval dish, instead of inking slab. Then the same procedure was followed. Following this procedure inking uniformity even of those subjects with deep palmar hollow could be maintained.

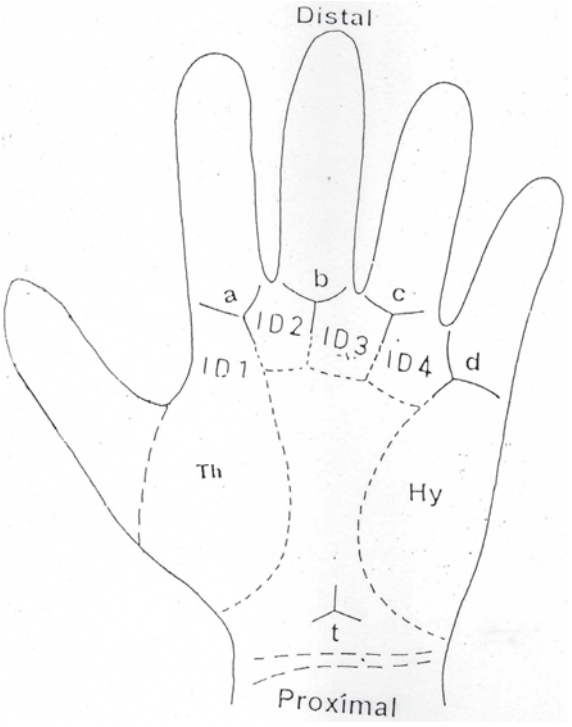

Fig.1. Schematic representation of dermatoglyphic pattern areas of a palm

Table-2: Percentage distribution of TPP in different palmar areas among control male and vitiligo male of left side

Subject & sex	Lt**Hyp TPP%**	Lt **Th TPP%**	Lt **ID1 TPP%**	Lt **ID2 TPP%**	Lt**ID3 TPP%**	Lt **ID4 TPP%**
CM	*18*	9	1.8	1.8	36	58.1
VM	29.4	5.8	3.9	15.6	41.1	58.8

Table-4: Percentage distribution of TPP in different palmar areas among control female and vitiligo female of left side

Subject & sex	Lt**Hyp TPP%**	Lt **Th TPP%**	Lt **ID1 TPP%**	Lt **ID2 TPP%**	Lt**ID3 TPP%**	Lt **ID4 TPP%**
CF	*32.6*	2	0	8.1	46.9	57.1
VF	32.7	6.5	3.2	3.2	27.8	55.7

Table-:5 Statistical Analysis of TPP at Hypothenar area

Hypothenar TPP	Controls (n=104)		Vitiligo (112)		Chi Square	P value
Right	Males (55)	20%	Males (51)	25.4%	0.46	0.49
	Females (49)	22.4%	Females (61)	36%	1.43	0.23
	Total (104)	21.2%	Total (112)	30.7%	2.38	0.12
Left	Males (55)	18%	Males (51)	29.4%	1.85	0.17
	Females (49)	32.6%	Females (61)	32.7%	0.60	0.44
	Total (104)	25.3%	Total (112)	31.07%	1.04	0.30
Both	Males (55)	19%	Males (51)	27.4%	1.3	0.25
	Females (49)	27.5%	Females (61)	34.35%	0.79	0.37
	Total (104)	23.25%	Total (112)	30.87%	1.4	0.23

If P > 0.05 it is not significant.

3) Inked hand of the subject was then placed on the sheet of paper (kept over the pressure pad placed over century board) from proximal to the distal end. The palm was gently pressed between intermetacarpal grooves at the root of fingers, and on the dorsal side corresponding to thenar and hypothenar regions.

4) The hand print sheet, the consent form and the dermatoglyphic data sheet were coded with name, age and sex.

5) The prints were then subjected for detail dermatoglyphic analysis with the help of magnifying hand lens and Magnavision.

6) Findings were cntered in the Dermatoglyphic data sheet.

Palmar Pattern Configuration: The palm has been divided into several anatomically well divided areas to carry out dermatoglyphic analysis. These areas approximate the sites of embryonic volar pads. They include the thenar area, hypothenar area and interdigital areas (Fig. 1).

Table-6: Statistical analysis of TPP at thenar area

Thenar TPP	Controls (n=104)		Vitiligo (112)		Chi Square	P value
Right	Males (55)	0%	Males (51)	5.8%	1.53	0.215
	Females (49)	6.1%	Females (61)	1.6%	0.54	0.461
	Total (104)	3.05%	Total (112)	3.7%	0.01	0.92
Left	Males (55)	9%	Males (51)	5.8%	0.07	0.79
	Females (49)	2%	Females (61)	6.5%	0.45	0.50
	Total (104)	5.5%	Total (112)	6.15%	0.02	0.88
Both	Males (55)	4.5%	Males (51)	5.8%	0.01	0.93
	Females (49)	4.05%	Females (61)	4.05%	0.08	0.77
	Total (104)	4.27%	Total (112)	4.92%	0.04	0.83

If P > 0.05 it is not significant

1.Thenar (Th): Thenar area is situated at the base of the thumb and labeled as 'Th'.

2.Hypothenar (Hyp): Hypothenar area is situated along the lower part of ulnar border of hand and labeled as 'Hyp'.

3.First, Second, Third and Fourth Interdigital Areas: (ID1, ID2, ID3, ID4)

The first, second, third and fourth interdigital areas are found in the distal palm in the region of heads of metacarpal bones. Each is bordered laterally by a digital triradii. The digital triradii are located proximal to the base of digits 2^{nd} to 5^{th}. Digital triradii are labeled as a, b, c, and d starting from digits 2^{nd} to 5^{th}. The interdigital area ID1 lie between 'Th' and 'a', ID2 between 'a' and 'b', ID3 between 'b' and 'c' and ID4 lies between 'c' & 'd'. If any (digital) triradius is absent, the midpoint of the base of the corresponding digits can be used to separate interdigital areas (Fig. 1).

True palmar pattern (T.P.P.):- (Fig. 2 and 3)

1) **Whorls**: - Typically there are three triradii varieties. We symbolized whorl concentric as $\mathbf{W^c}$ (PP), whorl spiral as $\mathbf{W^s}$ (PP), whorl double loop as $\mathbf{W^{dl}}$ (PP) (Fig. 2).

2) **Loops**: - In hypothenar area there are three directions of openings. These are opening towards radial margin--loop radial $\mathbf{L^r}$ (PP), ulnar margin – loop ulnar $\mathbf{L^u}$ (PP), carpal margin – loop carpal $\mathbf{L^c}$ etc. Loops in interdigital areas when open distally (common) labeled as loop distal --$\mathbf{L^d}$, proximally as loop proximal – $\mathbf{L^p}$, other types are $\mathbf{L^u}$ (PP) & $\mathbf{L^r}$ (PP) (Fig 2 and 3).

3) **Arches** :- In the same manner as above the arches are labelled as- Arch plain with direction of concavity towards ulnar side is $\mathbf{A^p\ u}$, and accordingly Arch plain radial is $\mathbf{A^p\ r}$, arch plain carpal is $\mathbf{A^p\ c}$. similarly tented arches with direction of concavity are like – arch tented ulnar as $\mathbf{A^t\ u}$, arch tented radial is $\mathbf{A^t\ c}$.

If two configuration are present in the palmar area, they are called **Duplex** and expressed as double true palmar pattern or **D.P.P**. e. g. $\mathbf{L^u + L^r}$, $\mathbf{L^u + L^u}$, $\mathbf{L^r + L^r}$, $\mathbf{L^r + L^r}$,

Table-7: Statistical analysis of TPP at ID1

ID1TPP	Controls (n=104)		Vitiligo (112)	
Right	Males (55)	0%	Males (51)	0%
	Females (49)	0%	Females (61)	1.6%
	Total (104)	0%	Total (112)	0.8%
Left	Males (55)	9%	Males (51)	3.9%
	Females (49)	2%	Females (61)	3.2%
	Total (104)	5.5%	Total (112)	3.55%

A^t c +L^r etc. They should be written as distal pattern first or radial pattern first as their position in particular palmar area (Fig. 3).

Super script letters (described above) as abbreviations indicating direction of opening of loops or to qualify the formation of whorls or arches were suggested by *Cummins* and *Midlo*.[12] We used (PP) to distinguish the palmar pattern from Digital pattern.

In the present study statistical evaluation was done consecutively with discussion about comparative analysis among the controls and affected cases. Main observations were compared with the findings of similar studies done by previous workers.

Statistical tool for Data analysis: Data analysis was done by Epi info 6, Version 6.04 d - Jan 2001 which is a software provided by the W.H.O. free of cost.

OBSERVATIONS AND RESULTS

The dermatoglyphic study of hands of 104 controls, 112 vitiligo patients are analysed according sex and side of hands. In the present study out of control subjects, 55 were males (CM) and 49 were Females (CF). Out of vitiligo patients 51 were males (VM) and 61 were females (VF).

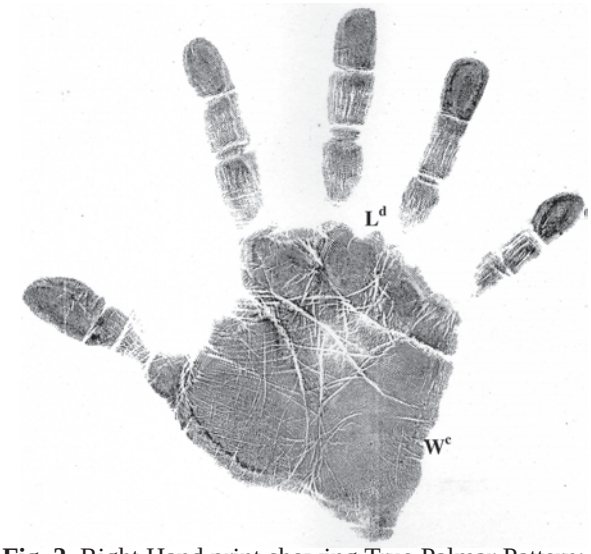

Fig. 2. Right Hand print showing True Palmar Pattern; Rt. Hyp→concentric whorl W^c (PP) with three triradii; ID 3→ L^d (PP) (PP = Palmar Pattern)

Each hand print was observed and analysed for the following parameters, separately according to side and sex and also both sides and sexes together.

Analysis of True Palmar Pattern: Vitiligo male subjects showed (Table-1) increased percentage of true palmar pattern (T.P.P.) in right hypothenar(25.4%), thenar(5.8%) and 2nd(13.7%) interdigital areas but decreased percentage of TPP in 3rd(54%) and 4th(50.9%) interdigital areas, almost equal percentage in 1st interdigital area – when compared with hypothenar(20%), thenar(0%), 2nd(10.7%), 3rd(54.5%) and 4th(56.3%) interdigital areas of control male of same side.

In left side of vitiligo males, (Table-2), we found that there was increased percentage of T.P.P. in left hypothenar (29.4%) (CM-18%) and interdigital 1st (3.9%) (CM-1.8%), 2nd (15.6%) (CM-1.8%), 3rd (41.1%) (CM-36%) and 4th (58.8%) (CM-58.1%) areas but the thenar area shows a decreased percentage (5.8%)(CM-9%).

Table-8: Statistical analysis of TPP at ID2

ID2 TPP	Controls (n=104)		Vitiligo (112)		Chi Square	P value
Right	Males (55)	10.9%	Males (51)	13.7%	0.20	0.65
	Females (49)	12.2%	Females (61)	0%	5.7	**0.01 ***
	Total (104)	11.55%	Total (112)	6.85%	1.24	0.265
left	Males (55)	1.8%	Males (51)	15.6%	4.89	**0.02 ***
	Females (49)	8.1%	Females (61)	3.2%	0.49	0.48
	Total (104)	4.9%	Total (112)	9.4%	1.98	0.159
both	Males (55)	6.35%	Males (51)	14.65%	1.26	0.26
	Females (49)	10.15%	Females (61)	1.6%	2.38	0.122
	Total (104)	8.25%	Total (112)	8.12%	0.03	0.86

If P > 0.05 it is not significant. * Indicates significant difference

While considered vitiligo females on right side (Table-3), we found that increased percentage of T.P.P. in Rt. Hypothenar (36%) - (CF-22.4%) and ID-1(3.2%) - (CF-0%) only, but decreased percentage in other palmar areas.

In left side, (Table 4), we found an increased percentage of T.P.P. in thenar (6.5%) (CF-2%) and ID-1(3.2%) (CF-0%), but decreased percentage in ID-2nd

Table-9: Statistical analysis of TPP at ID3

ID3 TPP	Controls (n=104)		Vitiligo (112)		Chi Square	P value
Right	Males (55)	54.5%	Males (51)	54%	0.00	0.95
	Females (49)	57.1%	Females (61)	50.8%	0.44	0.50
	Total (104)	55.8%	Total (112)	52.4%	0.21	0.64
Left	Males (55)	36%	Males (51)	41.1%	0.26	0.61
	Females (49)	48%	Females (61)	30%	2.87	0.03 *
	Total (104)	42%	Total (112)	35.55%	0.72	0.39
Both	Males (55)	45.25%	Males (51)	47.5%	0.63	0.86
	Females (49)	52%	Females (61)	40.95%	1.10	0.86
	Total (104)	48.62%	Total (112)	44.25%	0.42	0.51

If P > 0.05 it is not significant. * Indicates significant difference

(3.2%) - (CF-8.1%), 3rd (27.8 %) - (CF-46.9%) and 4th (55.7%) - (CF-57.1%) and almost no variation in hypothenar area.

DISCUSSION

Dermatoglyphics as a diagnostic tool is well established in a number of diseases having strong hereditary or genetic basis.[3,7,8]

In diseases with a hereditary background, certain dermatoglyphic variations are to be expected in vitiligo. Dermatoglyphic patterns throw light on expression of genes. Reviewing the literatures we found that several workers have linked this application with heriditory background. Lerner[13] and Fitzpatrick[14] reported on studies of family history in patients of vitiligo and showed that the family history was positive in 35.25% and 35% of cases respectively. While global incidence of vitiligo was found to be 0.1% to 1.3% [15] incidence in India was roughly estimated to be between 3% and 4%[16,17] Vitiligo has also been found to be associated more frequently with blood group AB.[18]

The increased number of female vitiligo cases within the same study period is probably due to greater concern for cosmetic disfigurement and related socio-marital problems.

Highlights from the observations of our study were processed, compared, discussed and statistically evaluated.

Our study showed (Table-1 to 4) increased percentage of true palmar pattern (TPP) in Rt. Hypothenar, Rt. Thenar and Rt. ID2 areas and significantly increased in Lt. ID2 in vitiligo males. Decreased percentage of TPP in Rt.ID3 and Rt. ID4 found in vitiligo males. In vitiligo females increased percentage of TPP in right hypothenar and right ID1 and there was significant decrease in Rt ID2 and Lt ID3 when compared with that of control (Table-5 to 10).

Our findings did not coincide with study done by Singh *et al*.[1] In contrast to our findings they found increased frequency of TPP in all palmar areas except hypothenar in vitiligo males. But in vitiligo females they found an increased incidence of TPP in ID2, ID3, ID4 and hypothenar area with slight decrease in thenar area. Variability of results about distribution of TPP in vitiligo subjects (except a partial tally with our study, about increased frequency in right thenar and both ID2 in vitiligo males and right hypothenar in vitiligo females) was due to larger sample size (almost double) of their study.

Table-10: Statistical analysis of TPP at ID4

ID4 TPP	Controls (n=104)		Vitiligo (112)		Chi Square	P value
Right	Males (55)	56.3%	Males (51)	50.9%	0.3	0.58
	Females (49)	55.1%	Females (61)	44.2%	1.28	0.258
	Total (104)	55.7%	Total (112)	47.22%	1.24	0.21
Left	Males (55)	58.1%	Males (51)	58.8%	0.01	0.91
	Females (49)	57.1%	Females (61)	55.7%	0.02	0.88
	Total (104)	57.6%	Total (112)	57.25%	0.01	0.93
Both	Males (55)	57.2%	Males (51)	54.85%	0.02	0.897
	Females (49)	56.2%	Females (61)	49.95%	0.69	0.40
	Total (104)	56.6%	Total (112)	52.3%	0.53	0.46

If P > 0.05, it is not significant

Analysis of Table-8 showed in ID2 palmar area of vitiligo female there was statistically significant decrease of the percentage of TPP in Rt. Side (0%), but in case of vitiligo males there was significant increase in Lt. Side (15.6%), when compared with that of control females (12.2%) and control males (1.8%) of the corresponding side respectively. Significant P values were respectively 0.01 and 0.02.

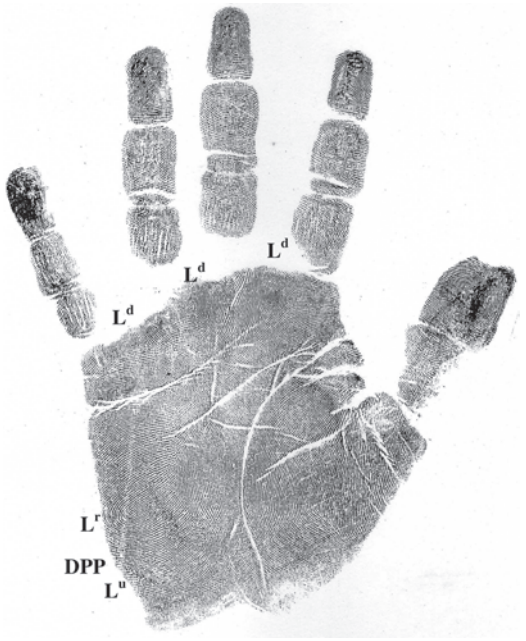

Fig. 3. Left Hand showing True Palmer Pattern; Lt Hyp→ L^r(PP) & L^u(PP) = DPP; ID 2→L^d(PP); ID 3→L^d(PP); ID 4 →L^d(PP);

Analysis of Table-9 showed that there was statistically significant decrease of the percentage of TPP in ID3 palmar area of vitiligo female in Lt. Side (30%), when compared with that of control female (48%) and the significant P value was 0.03.

Summary and conclusion

In male vitiligo subjects we found that they had increased TPP in Right hypothenar (Rt. Hyp.), right thenar (Rt. Th.) and both inter digital areas 2 (Rt ID2 and Lt.ID2) and decreased TPP in Rt. ID3, Rt. ID4.

In female vitiligo subjects we found, increased TPP in Rt. Hyp., Rt. ID1 and decreased number of TPP in Rt. ID2 and Lt. ID3.

The present palmar dermatoglyphic study virtually suggested that multiple parameters to be taken into account for stating the predisposition of Vitiligo.

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