On the Demarcation Lines of Pigmentation Observed Among the Japanese, on Inner Sides of Their Extremities and on Anterior and Posterior Sides of Their Medial Regions.

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Concerning pigment anomalies, there was observed several peculiar types in Japanese. The reason for it is thus explained, such as that the color tone of the skin of Japanese has the most adequate conditions in making delicate changes in the pigmentation. A type of such anomalies to be described following is found often in Japan, but not yet reported, I am sure, in the foreign land.

A 22 years old female clerk visited our clinic the other day for the treatment of Eczema acutum and Pityriasis versicolor, and we noticed marked demarcation lines of pigmentation on inner sides of her both upper arms, extending towards the upper border of the axilla, which had no connection with her present diseases. Then, a 16 years old school girl with Acne vulgaris called at our clinic, and we found that she showed of about 1 cm. having fine dentate borders, at her sternal region, and which slightly broadened at the lower border of mammary region and extended to the pit of her stomach.

To mention, the allied observations of such demarcation lines hitherto reported, were already in 1913 described by Matsumoto only, then no attention was drawn to this; again in 1939 Toyama referred to this anomaly. Following it Kitamura reported on his own observations in 1943. Among the internists, in 1942 Akio Maruyama, given a hint by his brother Kotaro Maruyama, made a survey on this phenomenon with 938 patients and soldiers admitted to the Hirosaki Army Hospital, and a little later the latter author in addition to his patients also made allied observations with 400 employees of a department store and reported the results in 1943.

Summarizing these observations, the demarcation lines of skin pigmentation with their specific localities of occurrence, may be classified into
the following types (Fig. 1.):

A) The upper arm groups.

*Type I.* It begins from the middle part of the inner side of the upper arm, runs straightly near the boundary between Regiones brachiorum ant. and med., or rather nearer to Sulcus musculi bicipitis brachii ulnaris or Sulc. muscul. bicipit. radialis, passes by the upper border of the axilla and then tends slightly downwards median.

*Type II.* It is a similar to Type I, running horizontally toward the median line after passing the upper border of the axilla.

*Type III.* It is also a similar line with the terminal traversing the upper part of the mammary region, whereby widely waving, and then connecting with the terminal of the corresponding line on the opposite side.

*Type IV.* The terminal of which forms a fine, but not so clear white wedge with its pointed head at the upper border of the axilla.

The peripheric terminals of the lines of these types, sometimes extend to the elbow pit on a little inner-wards from its center, or are to be traced therefrom even to the wrist along the radial side of the forearm.

B) The demarcation line on the lower extremities begins from nearly the middle of the perineum, and runs almost straightly toward the inner border of Fossa poplitea.

C) Those seen in Regio sternalis uniformly arise near the upper edge of the sternum, but their further course divides them into two types.

*Type I.* They straightly descend a little median from Lineæ sternales symmetrically on both sides, and reach the pit of the stomach.
Type II. The lines slightly diverge outer-wards nearly at the boundaries between Regio mammalis and Regio inframammalis.

D) Although rarely, one can find such type of demarcation lines running down-wards along the border-lines on both sides of Regio mediana dorsi.

Closely observed, the borders of the demarcation lines have many fine dentations. When the arms are raised, the lines appear to be straight or slightly curved from the distance, and in the case of A groups by the same figure the tone of pigmentation underside the demarcation lines is less intense to that of the upper side, in the case of B group in the front and in cases of C and D groups towards their medial sides. The difference of the color between the demarcated two divisions is usually not so marked, therefore, without special attention, the lines are often overlooked. As a good proof of it, there were no patients who visited the clinic with a complaint of the line as the main symptom.

There happened also cases showing a typical demarcation lines, such as unilateral upper arm line, which were often seen on the left arm. Furthermore, Matsumoto observed pigmented line, although it is broken, at that places of the demarcation lines of the upper arms and thighs, and described that they looked like Linea nigra seen in the median line of the abdominal wall.

In all instances, both terminals of the demarcation lines gradually go over to the rest of skins in a very natural way, so that it is difficult to identify precisely their endings in most of the cases.

To mention the histological studies of these demarcation lines, Matsumoto examined the specimens taken from a thoracal demarcation line, and reported that the difference in the pigment distribution between both halves of the demarcation line was but very slight. Examining the specimens taken also from a line on the thorax of the second case mentioned above, the author found that there were portions containing pigment corpuscles in the basal cells of the epidermis as in the normal skin, and portions having only in the basal cells in the point part of rete-pegs, but none or few in basal cells facing at the apices of the papillary layer. However, such portions were not always divided with certain clear cut limitations, in some specimens such portions as described above were mixed together, and no histological changes else could be seen.

As for the grounds, causing the difference in color tones along the demarcation lines, A. Maruyama and Kitamura attributed it to the reduction of pigment in the pale part, while K. Maruyama described that he thought it was due to increase of pigment in the dark colored part, and that he found normal pigmentation or sometimes reduction of pigment in the pale part. Matsumoto, further, wrote that, as a matter of fact, the
color tone of the skin took sudden change along the demarcation lines, while usually gradual change should have taken place. From the histological findings, the author himself concurs with the view held by A. Maruyama and Kitamura, that the causation of the demarcation lines is due to the decrease of pigment.

As for the sexual distribution of the demarcation lines, K. Maruyama described they were more frequently found among the female (39%) than among the male (23%). And about the age distribution, Matsumoto observed them from 3 years old up to 51 years old persons, and K. Maruyama reported that they were seen from a 11 years old child up to persons of considerably advanced age.

The allied phenomenon to the demarcation lines of pigmentation as so-far described, had long been known. It is Linea nigra (Sarwey) or Linea fusca (v. Rosthorn) appearing along the median line of the abdominal wall. This black or brown pigment line is well known to become more marked in the time of pregnancy. Existing even among normal persons, it begins at the epigastrial region, encircle the naval and reach symphysis region. Its borders with many dentations are clearly delimited from the surrounding part of skin, especially so in the hypogastrial region. It is located truly as the extention of the demarcation lines in Regio sternalis described above, and occupies the abdominal median line. And the former shows increase of pigment and the latter decrease, but both concur at the view point of the change in pigmentation. Moreover, Matsumoto observed pigment lines, although broken, similar or atypical one of the black line, in the site of the demarcation lines on the upper arm and the thigh. Such findings may lead to the conception that both are regarded to be essentially of the same origin. However, there is no report of observation of the white demarcation lines in Regio sternalis and the abdominal pigment line in the same person, nor any report that the former is influenced by pregnancy as the latter markedly does.

From what are the pigmentation demarcation lines originated? Referring hair stream, cleft line (Langer), marginal line (Voigt), axial line (Sherrington), etc., Matsumoto insisted that, none of those is related to the demarcation line. The author's view in this connection will be discussed below. No anatomical or physiological grounds, which would possibly explain the origin of the demarcation lines, namely those beginning from upper arms and extending to the thoracal region, those coming on the inner sides of the thighs, and those appearing on the anterior and posterior medial regions, are conceivable to be sought, except the author's view to be explained below.

For convenience, to discuss the author's issue, several passages in Foerster's work will be summarised. "Dermatoms are duplicated with
Demorcation Lines of Skin Pigmentation in Japanese

each other, so cutting a dorsal radix will not result in deprivation of sense. However, this duplication does not take place in certain localities, namely, on median lines and on the so-called axial lines of the extremities.” “The axial lines of the upper extremities begin from the sternum, pass the frontal side of thorax, shoulders and upper arms, and then extend to the periphery, and they, hereby, form clear-cut marginal lines.” “The axial lines of the lower extremities appear on the inner and outer sides of the thighs, the inner ones begin directly under the pubic bones, run downwards, reach the knees, and then they run on the dorsal sides of the legs. But the clear marginal lines exist only on the thighs.” “In the human beings upper extremities, C4, C5 and C6 are preaxial, namely, oral-wards, while C8, Th1, Th2 and Th3 are postaxial, namely, caudalwards, and C7 comes outer or inner-wards of the imaginary axial lines.” “In the lower extremities, L2, L3, L4 and L5 are preaxial, while S1, S2 and S3 are postaxial. But those, which form the clear-cut marginal lines on the thighs are L2, L3, L4, S2 and S3.”

The marginal line of the distribution of the nerves as summarised above, coincides precisely with the afore-reiterated four demarcation line of pigmentation. Moreover, besides this note-worthy coincidence, no other anatomical and physiological grounds, which can simultaneously explain the occurrence of demarcation lines on four different regions of the body, could be sought.

Although it is described that, the axial lines do not form such clear-cut marginal lines in human beings, as in the case of monkeys, it is quite conceivable certain atavistic phenomena may and do occur not infrequently, which would cause the occurrence of such demarcation lines in concern. The author, thus, believe that the difference in the development of axial lines in human beings and monkeys, does not make up data to deny such outstanding fact of coincidence as mentioned above. Let the author mention again that, the demarcation lines of pigmentation, namely, those arising on the inner sides of upper arms and extending to the upper parts of the mammary region, those beginning from perineum and extending to the knees over the inner sides of thighs, and those appearing along the anterior and posterior medianlines, do precisely coincide with the very demarcation lines of distribution of the centripetal nerves. After all, the phenomenon so far discussed seems to be nothing but endorsing the fact that, intimate relationship exists between the innervation and the pigmentation, which has long been pointed out by various authors.

References.