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DERMAL PAPILLAE;

THE HISTOMORPHOLOGICAL CHANGES IN THE HEIGHT OF DERMAL PAPILLAE OF HUMAN SKIN, IN DIFFERENT AGE GROUPS.

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ABSTRACT… Introduction: To study and compare the changes in the height of dermal papillae in the skin of different age groups in a segment of Pakistani population. **Study Design:** Cross sectional study. **Period**: Five months, from July 2010 to November 2010. **Setting:** Anatomy Department, Army Medical College, Rawalpindi. **Materials & Method:** Sixty volunteers of both sexes, after fulfilling the inclusion criteria, participated in this cross sectional study. They all gave written informed consent. They were divided into three equal groups according to their ages, Group A ranged in age from 18 – 29 years, Group B from 30 – 49 years, and Group C > 50 years. Punch biopsies were taken from the sun protected upper arm skin, from all volunteers, after giving local anaesthesia. Samples were stained with Hematoxylin and Eosin. They were observed under light microscope. Height of dermal papillae was measured at three random sites in each sample and mean was taken. The mean of all three groups was compared with each other and data was analyzed. **Results:** The mean of each sample was taken and then final mean of each group was calculated. They were then compared with each other. The mean height of dermal papillae of group A was 98.667μm, that of group B was 83.333μm and the mean height of dermal papillae in group C was 47.33μm. There was significant difference between the three groups and 'p'-value was less than 0.5. **Conclusion:** At the end of this study, it was concluded that, the height of dermal papillae reduces significantly with age.

Key words: Ageing, Dermal Papillae, Skin, Human Skin.

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INTRODUCTION

All intrinsic and extrinsic factors affecting an individual during his life influence the ageing process. Its effects can be both physical and psychological, affecting the social standing of that individual. In this modern age where people are living longer, and leading active and healthy lives, society demands that they appear younger than their actual age.[1] The visible changes associated with ageing can lower the morale and self-esteem of such inividuals.[2] The underlying health status of an individual is also reflected on the skin, and looking older is presumed to be a sign of ill health and impending death.[3] Ageing is also associated with many medical and cutaneous diseases, even though it is a physiological, not a pathological condition. Degenerative disorders and neoplasms may have a direct correlation with ageing.[4] Ageing causes oxidative damage of cells leading to accumulation of free radicals. Prolonged exposure to sunlight increases the levels of reactive oxygen species (ROS), leading to skin damage. This proves that low level of oxidative cellular damage and high level of antioxidants will result in younger looking skin.[5]

Skin undergoes regeneration and renewal throughout life and repeated mitotic divisions in cells with increasing age result in telomere shortening. Although this process is protective and prevents abnormal proliferation of cells, but at the same time, it causes cellular ageing. The telomere length is maintained by the telomerase enzyme. Telomerase is also active in the epidermal cells, suggesting that increased telomerase activity in epidermal cells will prevent cellular ageing, maintaining younger looking skin, along with skin function and proliferation. Reactive oxygen species may cause rapid shortening of telomeres in skin cells. The easy

accessibility of skin makes it an ideal organ for studying telomerase activity and telomere length with regards to ageing.[6] Protection provided to our skin can be endogenous (synthesis of melanin and enzymatic antioxidants) and exogenous (antioxidants in food, like vitamins A, C, E). Intrinsic repair processes become less effective with age and skin starts to show effects of ageing.[7]

Topical antioxidant preparations derived from plant extracts revitalize the skin and reduce signs of skin ageing.[8] It has been difficult to find animal skin similar to human skin for the purpose of study because it is very different in histological and molecular structure.[9] There are two main processes that induce skin ageing: intrinsic and extrinsic. Extrinsic ageing is caused by environmental factors such as sun exposure, atmospheric pollution, smoking, alcohol abuse and poor nutrition. Intrinsic ageing reflects the genetic background and depends on time. Intrinsic ageing shows smooth, thin skin with deep expression lines and fine wrinkles. Extrinsically aged skin is characterized by photo damage as coarse wrinkles, pigmented lesions and uneven skin tone.[10] Differentiation between the effects of true biological ageing and environmental factors, is important when studying ageing, for taking better protective measures. However, factors that play important roles in skin ageing and the ageing patterns in different races or areas are largely unknown. Many studies have not been done on ethnic and racial differences in the patterns of skin ageing.[11] Ethnic specificity creates different patterns of skin ageing among different ethnic groups[12], for example, pigmentation and wrinkling patterns in yellow skin differ from those in white skin.[13] It is commonly considered that Europeans and Asians have different skin ageing features. Wrinkles appear nearly 10 years later in Chinese women as compared to French women.[14] The cutaneous effects of ageing based on ethnicity, are varied, due to underlying structural and functional differences. Ethnicity and race are often used interchangeably in the medical literature. Ethnicity typically refers to broader groups of populations with a common culture and/or language, while race often represents a group of people with genetic resemblance. A detailed knowledge of the structural and functional properties of ageing ethnic skin is required, especially in today's world where individuals live longer and are more productive, even in older age. Although histology of ageing skin has been studied extensively, no data is available for our population. The purpose of this study was to study skin ageing patterns in our country.

MATERIAL & METHODS

The cross sectional study was conducted at Army Medical College, Rawalpindi, for a period of Five months, from July 2010 to November 2010. All protocols were approved by the Ethical Committee of Centre for Research in Experimental and Applied Medicine (CREAM), Army Medical College, Rawalpindi.

This cross sectional study was conducted at Anatomy Department, Army Medical College, Rawalpindi in collaboration with Rawalpindi Leprosy Hospital and Military Hospital Rawalpindi. A total of sixty volunteers of both sexes participated in this study. All study participants gave written consent before their inclusion in the study. The exclusion criteria included history of use of anti-aging creams, concurrent skin infections or obvious signs of malignancy. The participants were divided, according to their ages, into three equal groups.[15] Individuals ranging in age from 18-29 years were included in Group A. Ages 30-49 years in Group B, and more than 50 years in Group C. Four-mm full-thickness punch biopsy of sunprotected upper arm skin[16] was obtained from each individual after administration of local anaesthetic injection. The left upper inner arm was selected because being a sunprotected area, it is expected to show only the changes associated with pure chronological ageing, and will not be affected by environmental factors that exacerbate the intrinsic effects of time. Most studies have been done on the hands, forearms and face. Protected areas have been sadly neglected.[16] Tissues were fixed in 10% formalin solution and embedded in paraffin wax to make blocks. The samples were stained with Haematoxylin and Eosin and examined under light microscope. The height of dermal papillae was measured from the

dermoepidermal junction upto the point where the dermis starts to invaginate the epidermis. Three readings were taken under 10X objective. Their mean was taken as final reading of that sample. The mean of all readings in a single group was taken as final reading of that group. The final reading of groups A, B and C were compared with each other. Data was analysed using SPSS Version 16. The statistical significance of difference of various quantitative changes between different groups was determined by using Anova. Post hoc test was applied to make comparisons between the three age groups. The difference was regarded statistically significant if the "p" value was equal to or less than 0.05.

RESULTS

The height of dermal papillae was measured at three random sites in a single field at 10 X magnification. Their mean was taken. Final mean of all readings in each group was calculated. The mean height of group A was 98.667μm, that of group B was 83.333μm and the mean height of dermal papillae in group C was 47.33μm (Figure-1,2,3). The values of the three groups were compared with each other. Comparison between dermal papillae heights of male and female genders was not done. The 'P'value was significant on comparison of the three age groups. There was significant difference between the values of group C compared to groups A and B (Graph-1).

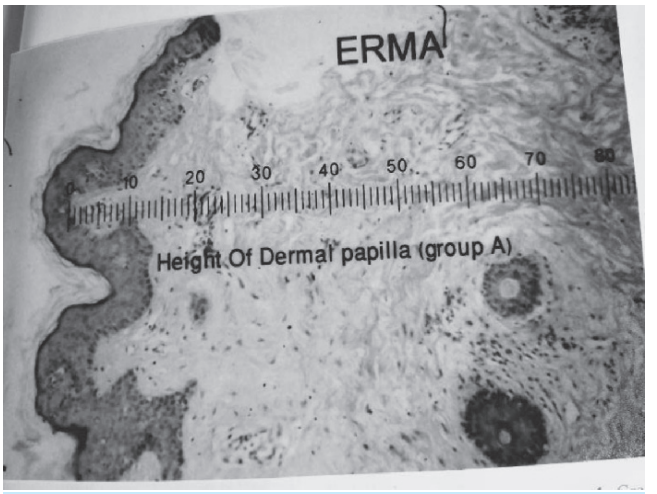


Figure-1. Photomicrograph showing the height of dermal papilla in a subject from group A, H & E stain, Approx X 400

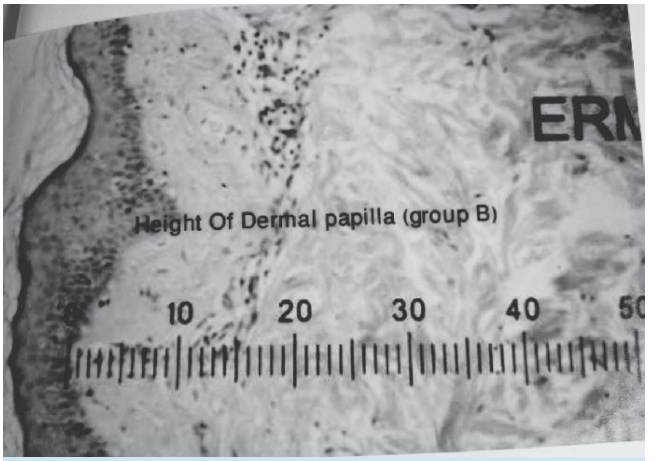


Figure-2. Photomicrograph showing the height of dermal papilla in a subject from group B, H & E stain, Approx X 400

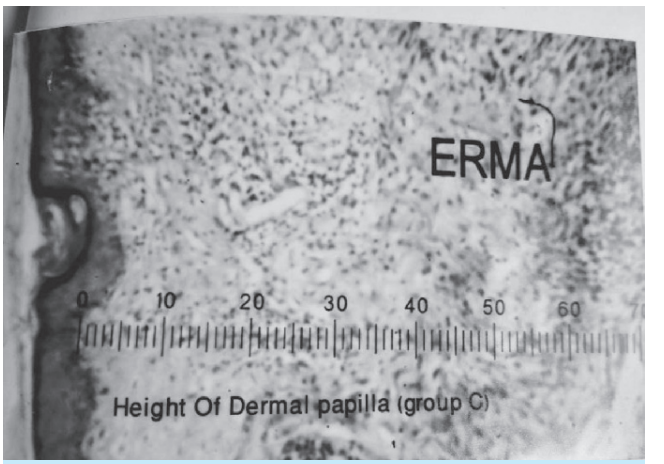
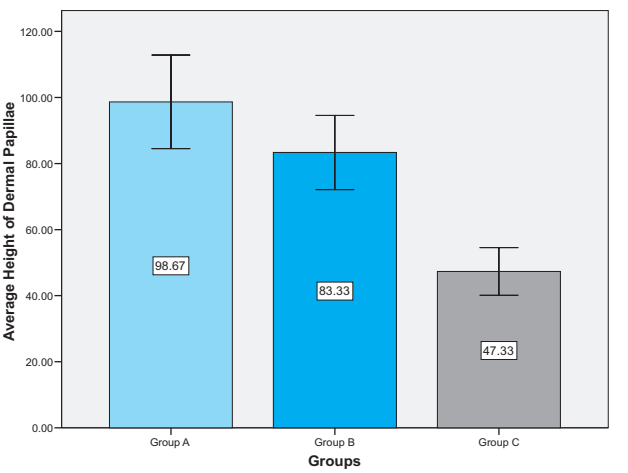


Figure-3. Photomicrograph showing the height of dermal papilla in a subject from group C, H & E stain, Approx X 400



Graph-1. Graph showing the comparison of average height of dermal papillae (μm) between the three groups

DISCUSSION

This study showed a significant reduction in the height of dermal papillae with purely chronological ageing. This leads to a considerable flattening of the dermoepidermal junction with age. Flattening of the dermoepidermal junction with age compromises the structural and mechanical integrity of skin, leading to a weakening of the anchoring system. Injuries and trauma are common in old people.[17] Ageing can be intrinsic or chronological, caused by the passage of time, influenced by ethnicity, and showing thin, dry skin with fine wrinkles. Photo aging, caused by sunlight, smoking, shows thick, dry and rough skin with coarse wrinkles. Flattening of dermoepidermal junction also gives skin a pale and sallow appearance.[18] fragility of skin increases and wound healing slows down because the epidermal regeneration slows by 30% to 50% after the age of thirty. There is more risk of postoperative wound reopening in aged people as compared to younger ones.[19] The most important aspect of intrinsic aging has been identified to be the flattening of the dermoepidermal junction, as the epidermal thickness remains constant with age, and the dermal thickness reduces only after the age of 80.[20] Chronological skin aging causes a decrease in the average height and depth of dermal papillae while the dermal papillae volume, number density and collagen density remains unchanged. The dermal papillae become shorter and wider. The epidermis being avascular acquires nourishment from the dermis, and the decreased contact between the two layers with age results in impaired nutritional supply of epidermis, leading to the formation of skin ulcers and impaired wound healing. A probable cause of flattening of dermal papillae with age may be the shrinking of elastic fiber present in the papillary dermis.[21] Flattening of the epidermal-dermal junction has been found to be a consistent feature of aged skin, seen in histological sections as a loss of rete ridges and the disappearance of papillary projections. Comparison was done in a study, between three age groups, and they were treated with Vitamin C. In the elderly group there were often large segments of flattening with a complete loss of papillae while the younger age groups showed less flattening with development of new dermal papillae after topical treatment.[22] A Japanese study found abnormal dermal papillae structures with age, and differences between the papillae of the face and other body sites.[23] Besides flattening, changes also occur in protein composition of skin along with decrease in protein content in intrinsically aged skin.[24] Evaluating the parameters of aged skin shows decrease in number and height of dermal papillae, and increase in cross-sectional area.[25] The benefits of greater knowledge of elders about the conditions of ageing skin can help reduce the medical burden and reduce the incidence of certain skin diseases. Furthermore, there is a need for educating of the younger population on the factors of skin ageing to prevent certain skin conditions as they become older.[26]

CONCLUSION

At the end of this study, it is concluded that the height of dermal papillae reduces significantly with intrinsic ageing, causing a flattening of the dermoepidermal junction. This reduction is more pronounced after the age of 50 years.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

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