Light and scanning electron microscopic examination of hair in Griscelli syndrome

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ABSTRACT

Griscelli syndrome is a rare disease characterized by pigment dilution, partial albinism, variable cellular immunodeficiency, and an acute phase of uncontrolled T-lymphocyte, and macrophage activation. Griscelli et al described this syndrome in 1978. Since then, only in approximately 60 cases have been reported, most from the Turkish, and Mediterranean population. In microscopic examination, silvery gray hair with large, clumped melanosomes on the hair shaft is the diagnostic finding. Here, we present scanning electron microscopic study of hair in 2 cases of Griscelli syndrome, where the hair showed normal cuticular pattern but nodular structures were present as an abnormal findings.

Saudi Med J 2007; Vol. 28 (8): 1275-1277

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Received 18th June 2006. Accepted 14th October 2006.

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Griscelli syndrome (GS), first described in 1978,[1] is a rare autosomal recessive disorder characterized by pigmentary dilution, variable cellular, and humoral immunodeficiency, acute phases of lymphocyte and macrophage activation, that can lead to pancytopenia, increased serum triglyceride levels, and hypofibrinogenemia. Although neurological involvement was not reported initially, it was observed later that various central nervous system manifestations including hyperreflexia, convulsions, lethargy, coma, regression of developmental milestones, hypertonia, nystagmus, strabismus, and ataxia due to cellular infiltration, could develop during the accelerated phase.[2] In this paper, we intended to report the light and scanning electron microscopic findings of hair in GS, the latter for the first time in literature.

Case Report. A large number of hair specimens were obtained from 2 boys; aged 5-years-old and 7-months-old. Both children showed typical manifestations of GS. They both had significant pallor and silvery gray hair. Their skin, iris, and retina had normal pigmentation. Totally, 29 hair specimens were picked from either individual, and examined. All of the samples were investigated by light and scanning electron microscopy (SEM). Light microscopic examinations were carried out by the classical method. For SEM investigation, the hair was directly mounted on metal stubs, and sputtered with a 100 Angström thick layer of gold in a Bio-Rad sputter apparatus and examined with a JEOL SEM (SEM ASIO-10), in 40-80 Kv.[3] On light microscopic examination of the hair shafts, a typical pattern of uneven accumulation of large pigment granules was observed, instead of the homogeneous distribution of small pigment granules that is seen in normal hair. Additionally, hypopigmentation that is the hallmark for GS was seen in the rest of the hair (**Figure 1**). On light microscopic examination, unevenly distributed clusters of aggregated melanin pigment, mainly accumulated in the medullary area of the hair shafts, was the most considerable finding. On SEM examination, both patients showed the same findings, where the cuticular pattern of hair was normal (**Figure 2**). In some parts of the hair shafts, nodular structures in a filamentous-keratinized character were detected **(Figure 3)**.

Discussion. Griscelli syndrome was first described in 1978,[1] and since then a small number of cases have been reported in literature.[4] The GS, referred, as partial albinism with variable immunodeficiency, is an uncommon disorder characterized by pigmentary dilution, and large pigment agglomerations on the hair shaft. It is inherited in an autosomal recessive pattern.[5]

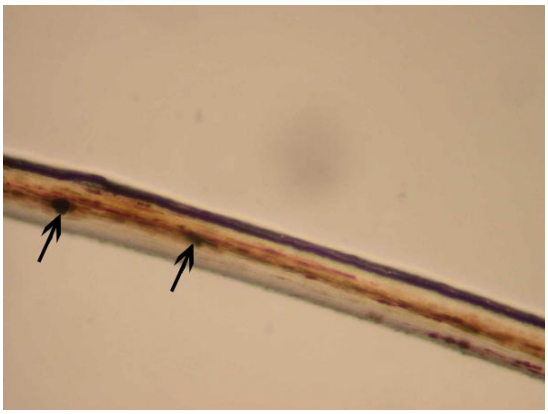

Figure 1 - Uneven accumulation of pigment in the hair shaft at the medullary area and hypopigmentation at the rest, light microscopic image (x 400). Arrows: irregular clumps of pigment.

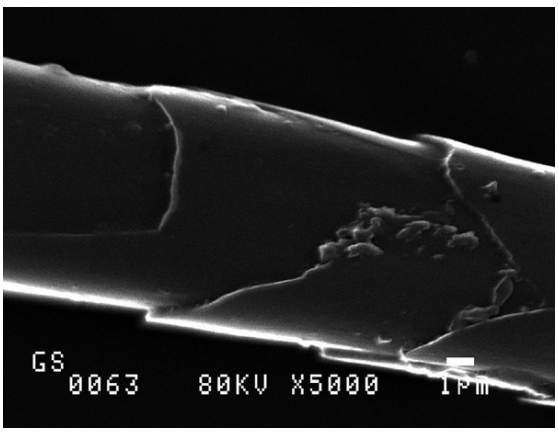

Figure 2 - The scanning electron microscopy image of hair, the cuticular pattern is normal (x 5000).

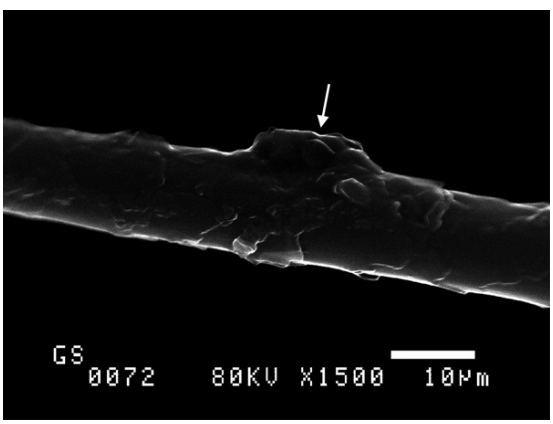

Figure 3 - The scanning electron microscopy image of hair showing nodular structures in a filamentous-keratinized pattern (x 1500). Arrow: nodular structure, filamentous-keratinized pattern (x 1500). Arrow: nodular structure.

The syndrome can be diagnosed with a typical clinical appearance such as silvery hair and light skin color. Most patients with GS are diagnosed between 4 months and 7 years of age. Dermatological findings may be limited to hair, but also skin and retinal pigmentation are occasionally affected. Microscopic examination of hair reveals uneven clusters of aggregated melanin pigment, accumulated mainly in the medullary area of the shaft.[4] The GS seems to be relatively common in Turkey, probably because of the high frequency of consanguinity.[6] Moreover, GS cases have been reported from India as well.[7] Currently, 3 different genetic forms have been described in GS: GS1, mutations in the genes encoding the molecular motor protein Myosin Va; GS2, mutations in the genes encoding the small GTPase Rab27a; and GS3, mutation in the gene that encodes melanophilin. Different mutations cause different clinical presentations of GS: GS1, neurological symptoms; GS2, immunological symptoms; GS3, hypopigmentation.[6] The differential diagnosis includes Chediak-Higashi syndrome (CHS),[8] and Elejalde syndrome (ES).[9] The CHS differs from GS by the presence of abnormal, giant cytoplasmic granules in leukocytes, more frequent cutaneous involvement, smaller, more evenly distributed pigment clumps in hair shafts and more consistent defective granulocyte activity.[10] In ES, spotty hair pigmentation is present as in GS, with an incomplete melanization of melanosomes in skin, but no immunodeficiency is seen.[11]

In our study, both clinical, and microscopic findings of the hair were consistent with GS. The cuticular pattern of the hair was normal, the hair surface was usual, and did not show any degeneration. However, nodular structures were noticed on the hair surfaces; these structures may reflect the uneven accumulation of large pigment granules within the medullary area of the hair. The hair surfaces have been studied for different purposes in the literature; Celik et al[8] recently reported a destroyed cuticular pattern, and degenerative areas on the hair surface in CHS. They also reported an abnormal proliferation of cuticular cells and deformed hair surface structures in hereditary trichodysplasia (HT).[12]

The SEM is a 3-dimensional examination technique revealing easily comparable images of various tissues for examination. It also permits considerable magnification. As in CHS,[8] ectodermal dysplasias,[13] and HT,[12] the routine usage of SEM in many diseases in which hair surface alterations are common, will result in a valuable contribution to the scientific literature. The SEM can be also used for routine diagnosis of GS. Furthermore, it should be useful in differential diagnosis in diseases affecting hair surface morphology.

Acknowledgments. *The authors are grateful to Prof. Dr. S. Ozden Sanal for providing the hair specimens and her scientific assistance. This study was funded by the Scientific Research Unit, Hacettepe University, Ankara, Turkey. Grant number: 03 D 12 101 002.*

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