THE EXFOLIATION SYNDROME

THESIS

Submitted in Partial Fulfilment
of the Master Degree in
(OPHTHALMOLOGY)

By
TAREK M. M. ABDALLA
M. B., B. Ch.

Supervised By
Professor Dr. OMAR RASHED
Prof. of Ophthalmology

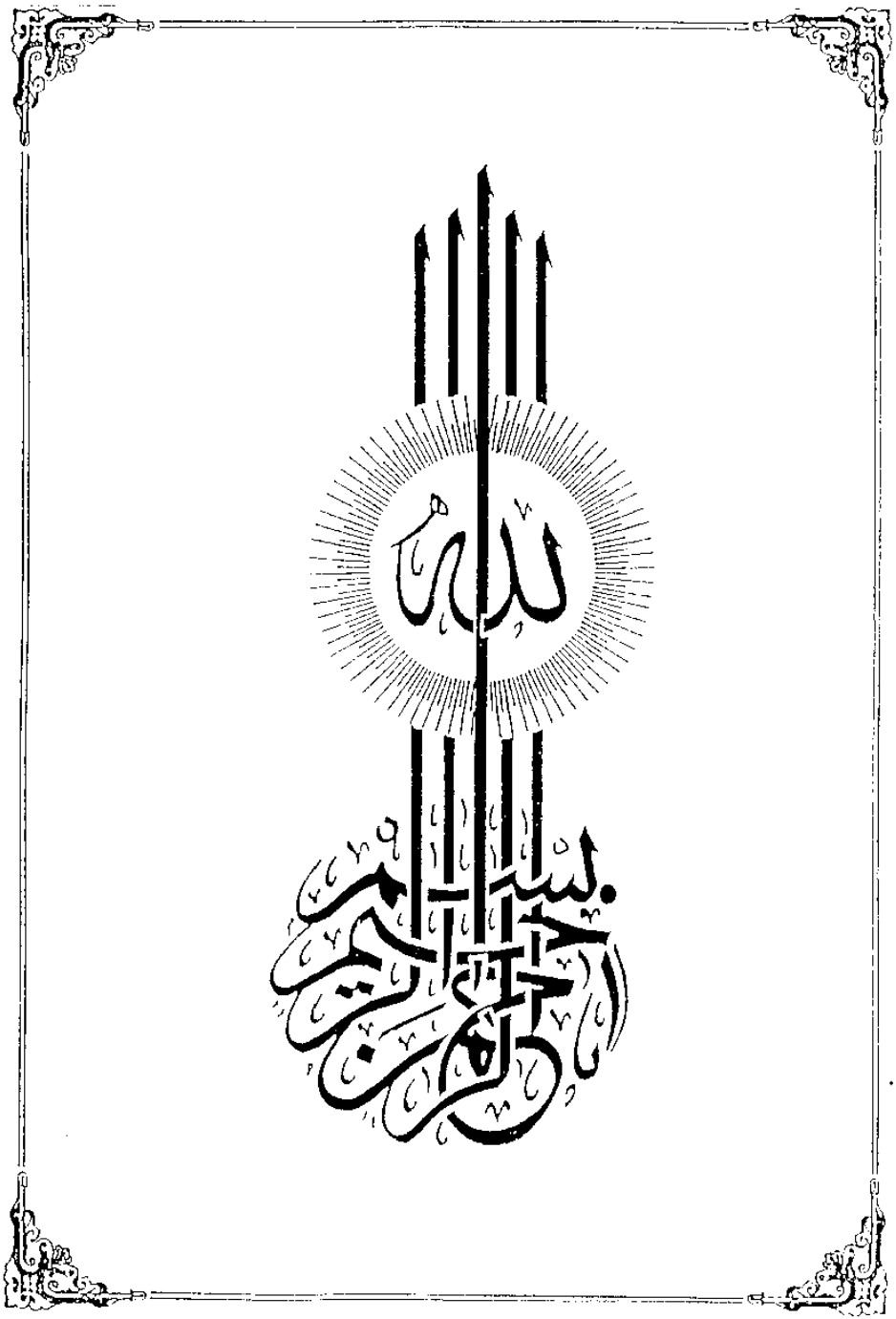
Faculty of Medicine
Ain Shams University

1982

ACKNOWLEDGEMENT

I wish to express my deepest gratitude to Prof. Dr. Omar Rashed for his helpful assistance, advice and encouragement during the preparation of this thesis.

I sieze this opportunity to extend my appreciation to all Professors and Staff members of the Ophthalmology Department, Faculty of Medicine - Ain Shams University, who contributed to deepen my knowledge in Ophthalmology.



C O N T E N T S

- - - - -

INTRODUCTION

INTRODUCTION

In the condition described as "exfoliation syndrome" there is a characteristic appearance of an exudate on the anterior surface of the lens, together with light grey particles (flakes or dandruff) in various positions in the eye (Duke-Elder, 1968).

The Finnish ophthalmologist, Lindberg (1917), was the first to point out that a number of patients with glaucoma presented with a bluish grey layer on their anterior lens capsule and small greyish white flecks at the pupillary border. However, no attention was paid to this observation until Mallong (1923) and Vogt (1925) published more exhaustive descriptions of the condition (Bertelsen, 1966).

Nomenclature:

Several names have been proposed for the condition known as the "exfoliation syndrome". Unfortunately they are all inappropriate, because each describes only one feature of the pathological change, and owing to the fact that the nature of the condition is still unknown, the proper name is to be awaited.

"Senile exfoliation of the lens capsule (Exfoliatio superficialis capsulae anterioris)" was suggested by Vogt in 1925 because he thought that the flakes were capsular

in origin. Although this view was widely challenged later by a number of eminent investigators who pointed out that the exfoliation consisted of a deposit of unknown material on the lens, they still agreed upon calling the condition "senile exfoliation of the lens capsule" (Tarkkanen, 1962).

"Glaucoma capsulare" is the name suggested by Vogt (1925) for an open-angle glaucoma associated with exfoliation of the lens capsule. Unfortunately, this name has been used by many clinicians to designate all cases of exfoliation syndrome with or without glaucoma (Sugar, 1957).

"Pseudoexfoliation of the lens capsule" was proposed by Dvorak - Theobald in 1954 mainly to differentiate the flocculi and membranes of the accretions on the lens capsule from the true exfoliation in which a coherent membrane splits away from the posterior layers of the lens capsule. This name is inappropriate either, because it neither explains the nature of the condition nor describes its morphological features. The term "senile exfoliation of the lens capsule" was reserved for a condition where true exfoliation of the lens capsule is induced by senile degenerative changes (Ashton, 1957).

"Irdiociliary exfoliation with capsular pseudoexfoliation" was suggested by Audibert in his thesis in 1957. This term is the most appropriate of those so far proposed, as

it clearly illustrates the pathology of the condition; the material exfoliates from the ciliary body, and in addition, there is pseudoexfoliation of the lens capsule. However, the name received no acceptance (Tarkkanen, 1962).

"Exfoliation of the pseudocapsule" (Barrie Jones, 1960) clearly describes one of the pathological changes, because sometimes the material deposited on the lens capsule forms an incomplete pseudocapsule with occasional shrubs rolling up like scrolls at the border. However, this name was also refused (Tarkkanen, 1962).

"Fibrillopathia epitheliocapsularis" (fibrillopathy) was suggested by Bertelsen (1969). He believed that the exfoliative material was derived from the lens epithelial cells. This term seems more appropriate than those previously used, as it covers both the pathogenesis of the condition as well as the pathoanatomical picture.

Fine (1979) suggested that the condition be called "basement membrane exfoliation syndrome". This descriptive name was to relate this condition to that of an abnormal basement membrane production.

Sugar (1979) stated that: "when electron microscopy by Bertelsen in 1964 and Ashton in 1965 revealed an actual involvement of the lens epithelial cells and capsule, and possibly also the pigment epithelium of the iris, the

designation pseudoexfoliation no more fits the condition."

Sugar (1979) suggested the name "exfoliation syndrome", as it indicates the presence of exfoliative material in the anterior segment of the eye without relation to its origin and without reference to the presence or absence of glaucoma.

AETIOLOGY

AETIOLOGY

Two theories well established themselves in connection with the pathogenesis of the so-called exfoliation syndrome.

Vogt (1925) asserted that the changes were caused by exfoliation of the lens capsule owing to its degeneration. Microscopically, he demonstrated vacuolation, thickening, lamellar fraying and localised thinning of the capsule. (Arnesen, 1963). This view was shared by Sobhy Bey (1931) and Sugar (1947).

Sobhy Bey (1931) revieled laminated masses on the pupillary margins and the posterior surface of the iris which were thicker in the furrows and thinner along the edges. He also noted that this material had the same refractile structure and characteristics of the lens capsule.

Busacca (1928) found by microscopical examination that the substance on the lens consisted of small bush-shaped excrescences whereas the lens capsule itself was normal. He concluded that the substance could not have originated from the lens, but was merely a deposit on it. These deposits were thus frequently designated "Busacca's deposits" (Arnesen, 1963).

The exact site of origin of the deposits, however, is a subject of argument.

Berliner (1951) also included the Descemet's membrane, the zonule, and the lamina vitrea of Bruch's membrane besides the lens capsule, as probable sources of the deposits, because he found flakes on the zonule and drusen of the lamina vitrea and Descemet's membrane in cases of exfoliation syndrome.

The ciliary epithelium was suggested as the site of origin by Ashton (1957).

Gifford (1957) held the opinion that the substance arose from the lens capsule. However, he also put forward the view that the unknown material was produced by the ciliary body and the epithelium of the iris.

Tarkkanen (1962) found that the most abundant amount of exfoliative material, however, was observed on the ciliary processes, distributed evenly all around the ciliary body. Hence, it was thought that exfoliation might have originated from the ciliary processes.

Because in a number of cases with exfoliation the cells of the pigment epithelium of the iris showed degenerative changes in the form of a heavy discharge of pigment into the anterior chamber, Tarkkanen (1962) concluded that exfoliation could be a similar degenerative

process of the nonpigmented epithelium of the ciliary processes.

Vannas (1969) stated that: "the vascular disturbances are characteristic of the exfoliation syndrome. It seems reasonable to postulate that the pathologic changes occurring in the capillaries of the iris, and perhaps also of the ciliary body leading to extravasation and leakage, do produce the exfoliative material or lead to pathologic changes in the aqueous so that exfoliative material is produced. This is also supported by electron-microscopic studies by Ashton (1965) who found exfoliative material around the capillaries in specimens derived from excised pupillary portions of the iris".

Based on electron-microscopical findings, Bertelsen (1969) proposed that the lens epithelium produces a fibrillar substance which passes the fibrillar layer of the capsule as granules, attain their fibrillar structure once more as they reach the surface and are then poured out on the surface of the lens capsule where they form the characteristic bush - shaped excrescences. He concluded that the so-called exfoliation on the anterior surface of the lens seems to be dysfunction of the epithelial cells of the lens.

The excrescences on the anterior surface could also be detected in areas where the lens capsule seemed normal.

The most likely explanation for this finding is that the excrescences, owing to the movement of the iris, detach from their origin on the lens capsule and later on settle down on adjacent normal areas of the lens capsule(Bertelsen, 1969).

An autoradiogram of the anterior lens capsule following incorporation of tritiated thymidine into cell nuclei shows that the germinative zone of the lens epithelium generally speaking, corresponds to the amorphous layer and to the peripheral band in exfoliation syndrome (Bertelsen, 1969).

Bertelsen (1969) could not state with certainty, however, that all of the substance found on the iris, the ciliary body and the zonule were produced by the epithelium of the lens.

The possible degenerative effect of the aqueous on the lens capsule has been considered by Hitta as early as 1940. In this regard, one might anticipate the aqueous as different from normal in eyes showing exfoliation. However, in the studies by Cambiaggi (1957) and Ashton (1960) using paper electrophoresis, normal protein levels were found in the aqueous (Arnesen, 1963).

Dark (1969) postulated that some as yet unidentified lysosymal enzyme might be responsible.

Tylor (1979) postulated that basement membrane precursors are elaborated by the epithelial cells lining the anterior segment of the eye. These precursors diffuse into the aqueous and are denaturated by irradiation. These denatured proteins then polymerize and deposit on the intraocular surfaces, particularly the lens capsule. Some denatured proteins also pass into the extracellular spaces of the adjacent structures (the iris, ciliary body and conjunctiva) and form agglomerations there. The causative stimulus is provided by radiation, possibly global or ultraviolet radiation.

Sugar (1979) stated that: "the exfoliation syndrome is a basement membrane disease, mainly involving the iris pigment epithelium as well as the ciliary body epithelium and consisting of two processes, a minor one of actual exfoliation of the zonular lamella, and the more important one of basement membrane production with deposition by contact and aqueous transport onto the lens capsule.

In considering the source of the fibrillar material, there are only three parts of the eye which can be reasonable sources: the lens epithelium, the iris pigment layer and the ciliary epithelium. The ciliary epithelium is