Introduction

Lesions of the Adrenal Glands and Paragangliomas
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Ronald DeLellis, M.D.

Department of Pathology and Laboratory Medicine,
Brown Medical School and Lifespan Academic Medical Center
Providence, RI
“The adrenal glands are glands of mystery and adventure” (Sheldon C. Sommers, 1971)

The adrenal glands have had a long and complex history, and for many years, different schools of anatomy doubted their very existence. Although some authors suggested that the first description of the glands occurred in the Bible (Leviticus 3:4), most authorities credit Bartholomeus Eustachius (1520-1574) with the discovery of the adrenal glands in humans. In his great work, Opuscula Anatomica, Eustachius (1552) provided the following description of the adrenals which he referred to as glandulae renibus incumbentes:

“Even if many will consider sufficient what we have said about the surface of the kidneys, somebody could object that I have neglected something and I consider it indicated to say something of the glands, diligently overlooked by other anatomists. Both kidneys are capped on the extremity towards the cava by a gland… one, if he is not very attentive, does really overlook them, as if they were not present… early anatomists and those who write ample treatises on this art in our days failed to detect them. They, pretending to the exact, stand so obstinately for their own and their masters’ errors that often they seem to be fighters rather than searchers of anatomical truth.”

Eustachius’ work had many detractors. Archangelo Piccolomini, the man who advanced the concept that the testicles collect sperm from all parts of the body, wrote “Sometimes one may see two or more glands lying on the kidneys but we do not think that they deserve special attention because they are not found in every case and have no flesh or parenchyma of their own… they might be considered renal excrescences. Why do they exist in a few? The same way superabundance of material creates a sixth finger, they originate from a seminal surplus and that is the way they come out of the kidneys.”

Casper Bartholin (1611) referred to the glands as capsulae atrabiliariae and wrote that “they are to be found in all bodies, whatever Archangelo (who compares them to the sixth finger) may say… we call them, because of the function we attribute to them, the capsules of black bile… they contain a cavity, which holds a dark and faeculent liquid. Their use is still unknown.” Johann Vesling upheld this view when he wrote, “What their use is, the human mind has not conjectured.”

It took nearly 200 more years after Bartholin’s description to prove that the glands were solid and that their hollow appearance resulted from autolysis. Numerous hypotheses concerning their function appeared during this time including the notions that they served as accessory kidneys, reservoirs of black bile, producers of meconium and as “tissue fillers” to separate the kidneys from the diaphragm. Because of vascular connections with the testes and ovaries, it was also suggested that the adrenals played a key role in sexual function. Valsalva is quoted as saying, “I think they produce in male and female a liquid which is necessary for fecundation.” With the later discovery of the sex steroid hormones, Valsalva’s hypothesis seems remarkably prescient.
The late 19th and early 20th centuries witnessed a remarkable series of discoveries relating to the function and structure of these enigmatic glands. They were recognized as being compound endocrine organs consisting of the mesodermally derived cortex and the neural crest derived medulla. Epinephrine (adrenalin) was discovered and shown to be the major catecholamine of the medulla while glucocorticoids, mineralocorticoids and sex steroids were shown to be of cortical origin. During this same period, a wide array of hyperfunctional and hypofunctional states were discovered and their pathological correlates were identified. As suggested by Dr. Sommers, the adrenals really proved to be glands of adventure.

While many of the mysteries of the glands have been resolved, many questions remain. For example,

- Are traditional morphological and immunohistochemical parameters useful in the distinction of benign and malignant adrenocortical neoplasms?
- How useful are comparative genomic hybridization and gene expression profiling in the categorization of benign and malignant adrenocortical neoplasms?
- Can we reliably predict the malignant potential of pheochromocytomas and paragangliomas?
- What are the roles of the multiple endocrine neoplasia (MEN)-2, van Hippel Lindau (VHL) and succinate dehydrogenase genes in the development of pheochromocytomas and paragangliomas of both heritable and sporadic types.
- Do other genetic alterations play a role in the development of pheochromocytomas and paragangliomas?

This symposium will attempt to address some of these questions.
References

