Computed Tomography and Adrenocortical Carcinoma

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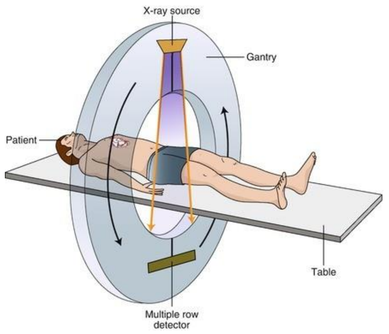
Introduction

- Adrenocortical carcinoma (ACC) is an abnormal growth of tissue located in the kidneys (Szász et al., 2020)
- ACC is a cancerous tumor (Szász et al., 2020)
- ACC has an incidence rate of .72-1.02 per million people in the United States. People in the Netherlands have one per million chance of having ACC (Shariq & McKenzie, 2021)
- ACC is the most common tumor originating from the adrenal cortex (Stewart & Story, 2017)
- Is more common in females than males (Stewart & Story, 2017)
- Is more common in the left kidney than the right kidney (Stewart & Story, 2017)
- Females who used hormone therapy such as birth control are at higher risk of developing ACC (Shariq & McKenzie, 2021)

Computed Tomography

- Creation of cross-sectional images via the use of a rotating x-ray tube
- Equipment used in the research process includes High Speed Advantage CT and GE Healthcare (Szász et al., 2020)
- **Contrast Studies**
- Used on CT scan to highlight specific areas of the body being examined. Can show blood vessels, intestines, or other structures (Mayo Clinic, 2020)
- Contrast can be ingested, injected, or inserted (Mayo Clinic, 2020)
- Lab values to assess kidney function used prior to patient receiving contrast to verify if contrast is safe for use (Mayo Clinic, 2020)



(Pelberg, 2015)

Symptoms of ACC

In adults:

- Non-specific abdominal pain, abnormal bruising, menstrual disturbances, low potassium concentrations, adrenal hormone excess, isolated hyperandrogenism, co-secretion of aldosterone and cortisol and aldosterone and isolated aldosterone excess (Kostiainen et al., 2019)

In children:

- Developmental delay, hypertension, increased weight, hypertrophy, pubic hair, penile growth, increase in height, advanced bone age, hypercortisolism, hyperandrogenism, and abdominal pain (Kostiainen et al., 2019)

Genetic Defects/Other cancers associated with ACC

- **Gene defects found:** (Kostiainen et al., 2019)
- KCNQ1OT (Beckwith-Wiedmann Syndrome)
- TP53 (Li-Fraumeni Syndrome)

- **Cancers associated with ACC:** (Kostiainen et al., 2019)
- Follicular lymphoma
- Earlier ACC
- Breast Cancer
- Lung Adenocarcinoma
- Prostate Cancer
- Strong family history of cancer

Treatment

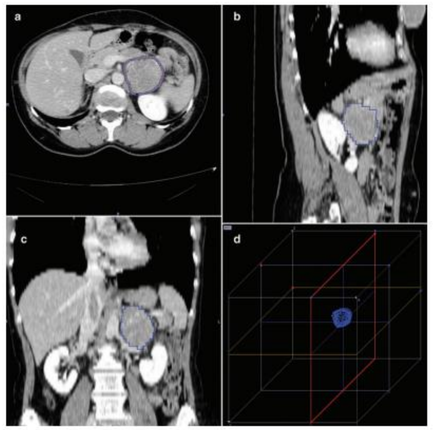
- Surgical resection with a recurrence rate of 40-70% (Shariq & McKenzie, 2021)
- Adjuvant therapy used with surgical resection to reduce recurrence rate (Shariq & McKenzie, 2021)
- Systematic therapy used when tumor is unresectable, extends life expectancy from 2 to 5 months (Shariq & McKenzie, 2021)

Characteristics of an ACC on a CT Scan

- Presence of irregular borders (Shariq & McKenzie, 2021)
- Areas of necrosis (Shariq & McKenzie, 2021)
- Hemorrhage (Shariq & McKenzie, 2021)
- Calcification (Shariq & McKenzie, 2021)
- Invasion into surrounding structures such as inferior vena cava (Shariq & McKenzie, 2021)
- Median diameter size of 10 cm or larger (Shariq & McKenzie, 2021)
- Tissue density (calculated by Hounsefield Units, HU) (Shariq & McKenzie, 2021)

CT Tools for Diagnosis of ACC

- **CT Histogram Analysis**
- Analyzes the initial unenhanced CT (Szász et al., 2020)
- Can be influenced negatively by noise (Szász et al., 2020)
- This method is not as accurate when the density is less than 0 HU (Szász et al., 2020)
- **Radiomics**
- New method that uses a variety of computational methods to obtain numerical parameters for the CT scan (Torresan et al., 2021)
- Obtains a measure of the lesion's heterogeneity based on image brightness (Torresan et al., 2021)



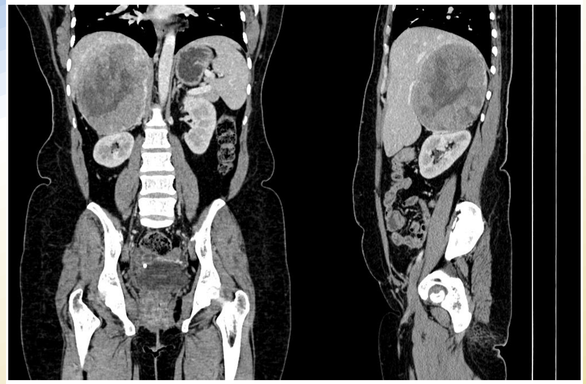
Picture represents the volume of interest (VOI) of an adrenal mass being investigated by Radiomics (Torresan et al., 2021)

Survival

- 5-year overall survival rate is 67%
- Stage 1 ACC 100% survival rate
- Stage 2 ACC 93% survival rate
- Stage 3 ACC 16% survival rate
- Stage 4 ACC 11% survival rate

Case Study

- A 40-year-old female patient presents with numbness and tingling of the skin for 15 days. Patient has right upper quadrant pain, hypertension, and recurrent hypokalemia



Sagittal radiograph Coronal radiograph

- Branches of right renal artery and right inferior phrenic artery are seen feeding the ACC
- The tumor has invaded the inferior vena cava which is only seen on the images after the contrast injection
- Diagnosis confirmed by performing an ultrasound guided biopsy of the right suprarenal lesion
- Treatment for the patient was a right adrenalectomy with an excision of the tumor embolus in the inferior vena cava (Aiyappa, 2021)

Conclusion

ACC is a very rare condition and does not have a great prognosis when caught late in stage 3 or 4. CT has proven to be the most beneficial in diagnosing ACC. More research is currently being completed to evaluate further ways to identify if the adrenal tumor is malignant or not before pursuing a more invasive route.

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