Carpal Tunnel Syndrome

**BACKGROUND**
Carpal tunnel syndrome is a common cause of pain and numbness in the hand. It occurs when the median nerve is squeezed (compressed) between the carpal bones (wrist) and a thick ligament (flexor retinaculum). It typically affects women at the age of 40-60 years old. Possible associated conditions are: diabetes, rheumatoid arthritis, hypothyroidism, pregnancy, oral contraceptives, or acromegaly.

**RELEVANT ANATOMY**
At the wrist, the median nerve travels from the forearm along with the tendons to the hand and crosses through the carpal tunnel to the hand. The carpal tunnel is bounded on the back of the hand (posteriorly) by the carpal bones and on the palm side (anteriorly) by the flexor retinaculum. The median nerve at the wrist supplies the small muscles of the thumb and the sensation over the palmar surface of the thumb, index, middle, and part of the ring finger. Sensation of the palmar surface of the hand is preserved in carpal tunnel syndrome, because this sensory nerve passes outside the carpal tunnel.

**SIGNS and SYMPTOMS**
Patients usually present with pain and numbness of the hands. Pain is particularly worse at night, relieved by shaking the hands or hanging them down. It is typically bilateral but one side is worse than the other. With disease progression, symptoms become more constant, and patients start feeling tingling and weakness of their hands.

**DIAGNOSIS**
Diagnosed is mainly based on the history. The physician can run some clinical tests (Tinel, Phalen), and some electrophysiological tests (EMG, NCS) to confirm the diagnosis. There is rarely a role for CT scan or MRI in the diagnosis of carpal tunnel syndrome.

**TREATMENT**
- Treat and possibly reverse treatable causes of carpal tunnel: Diabetes, hypothyroid, acromegaly,...etc
- Non-surgical treatment options include: rest, splinting, oral anti-inflammatory drugs, or rarely local steroid injections.
- Surgery is considered in persistent or progressive symptoms despite the previous measures.

**SURGICAL TECHNIQUE**
Surgery consists in cutting the retinaculum and opening the roof of the carpal tunnel thus releasing the pressure on the median nerve. This can be accomplished through a standard open technique or an endoscope approach. Outcome is mainly dependent on the complete division of retinaculum and release of pressure on the nerve.

**SURGICAL RISKS**
- Nerve damage; which can cause loss of sensation or weakness of the hand.
- Vascular damage; that can cause bleeding.
- No relief of the pain or worsening pain
EXPECTED OUTCOME

Results of surgery and improvement of painful symptoms are generally good in 90% of cases. Early failure is caused by incomplete section of the flexor retinaculum, or incorrect diagnosis. Late failure is caused by scar formation.

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RELEVANT TERMS

1 EMG: Electromyography; NCS: Nerve conduction studies
2 CT: Computed tomography
3 MRI: Magnetic Resonance Imaging

FIGURES

Figure 1: Carpal tunnel anatomy