Central Nervous System and Skeletal Muscle Involvement in Systemic Candidiasis

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Summary. Two necropsy cases of systemic Candida albicans infection with involvement of the kidney, lung and brain are reported. Both patients died from renal failure. In the brain there was a miliary spread of microabscesses and granuloma-like lesions, and Candida was evident within both types of lesion. In case 2, there was additional involvement of skeletal muscle and diaphragm with focal-grouped and single-scattered necrotic muscle fibres and small granulomas containing fungus elements accompanied by mild neurogenic atrophy of skeletal muscle due to "uremic" neuropathy.


Mycotic infections are occurring with increasing frequency as complications of neoplastic and other debilitating disease [4, 6] or following reduction of the defence mechanisms of the host by predisposing factors or modern therapy with immunosuppressants, antibiotics, steroids, and irradiation [6, 10, 14]. Although the brain together with the kidney, lung and myocardium are organs showing the highest susceptibility to disseminated Candida infection in man and experimental animals [6, 8, 12], involvement of the CNS in systemic candidiasis is relatively rare. A recent review of the literature revealed 42 cases of candidal infection of the brain [3] to which about 40 cases from other sources [6, 9, 10, 15] may be added. Whereas fungous myositis particularly due to actinomycosis infection is well known [1], skeletal muscle involvement in candidiasis has been rarely mentioned.

Two cases of acute disseminated Candida encephalitis, one associated with skeletal muscle involvement, in systemic candidiasis are presented in this report.

Case Reports

Case 1 — R.F. — Clinical History. The patient was a 42 year old man who was in good health until Jan. 3, 1968, when he underwent appendectomy. 3 days later, relaparotomy was performed because of acute peritonitis. Ileostomy was done. The postoperative course was complicated by oliguria with a rising BUN. Because of progressive uremia, 10 haemodialyses were performed with temporary improvement of the uremia. In spite of massive antibiotic treatment, the patient developed pneumonia. The following weeks his condition deteriorated, his BUN rose again, urinary output dropped. Tracheotomy and artificial respiration were performed because of increasing respiratory disorders. Finally, the patient lapsed into coma.
and developed generalized seizures. 3 days later, on Feb. 29, 1968, he died despite intensive treatment.

**General Necropsy** (271-68). There were abdominal scars following appendectomy and insertion of an inferior cava catheter. Ileostomy was present. There was diffuse adhesive peritonitis. The lungs contained a large focus of consolidation in the right upper lobe, and multiple small areas of bronchopneumonia. The liver and spleen were markedly enlarged. The kidneys showed multiple small abscesses.

**Microscopic Examination** (Rp 118-68) of the lungs revealed large areas of atelectasis with multiple foci of recent bronchial pneumonia and embolized PAS-positive fungi in small branches of the pulmonary artery. Multiple abscesses and granulomas containing giant cells and Monilia in yeast and pseudohyphal forms were found in the kidneys.

Postmortem bacteriological examination yielded Escherichia coli and proteus from spleen and kidney, and Candida from kidney. Cultures from the brain were not made.

**Neuropathological Findings** (N.I. 55-68). The brain was oedematous and hyperaemic throughout. The cerebellar tonsils were herniated and there was notching of the hippocampal gyri bilaterally. Microscopically, the brain lesions varied from frank, acute microabscesses consisting of necrotic foci surrounded by polymorphonuclear leukocytes and macrophages (Fig. 1A) to small granulomatous lesions and perivascular cuffsings with sparse lymphocytic and mononuclear cells. These lesions were scattered throughout the cerebral cortex, white matter, basal ganglia and brain stem. Candida in the form of yeast and mycelia were demonstrated in these areas with the use of PAS and KV stains (Fig. 1B).

**Case 2—Z. H. — Clinical History.** This patient, a man aged 67, had a history of a myasthenic syndrome of undetermined origin, beginning 5 or 6 years before his death. In April 1970, an acute myasthenic crisis with cardiac arrest occurred. In spite of reanimation, the patient showed severe organic psycho-syndrome due to diffuse hypoxic cerebral damage. In August 1970, after another myasthenic crisis, arterial respiration was necessary for several days. A tracheostoma was done. Two weeks later, the patient developed anuria and progressive uremia with rising BUN. Urine cultures yielded Candida organisms. One week prior to death, a nephrostomia was performed. Microscopic examination of the biopsy specimen showed multiple small abscesses and embolized fungi in the glomeruli. In spite of intravenous amphotericin treatment and haemodialysis, the patient’s condition deteriorated rapidly, and he expired on Sept. 25, 1970 in uremic coma.

**General Necropsy** (1362-70). The heart was normal in size and there was no evidence of valvular disease. There was considerable atherosclerosis of the abdominal aorta. The lungs contained multiple yellow areas of bronchial pneumonia and atelectasis. Tracheostoma was present. The liver and spleen were unremarkable. Multiple greenish-yellow abscesses were scattered in both kidneys.

**Microscopic Examination** (Rp 567-70) showed both lungs to have focal pneumonitis, with multiple small abscesses, containing Monilia in yeast and mycelial forms. Similar necrotizing foci and small abscesses were found in the kidneys, where fungi were also present in the distal canaliculi.

Postmortem bacteriological studies (Dr. Breitfellner) yielded Candida albicans from the kidneys and lungs. Cultures from the brain and blood were not made.

**Neuropathological Findings** (NI 324-70): Macroscopically, the brain showed slight diffuse atrophy and minimal atherosclerosis of the vessels at the base of the brain. Focal lesions were

**Figs. 1A and B. Case 1.** A Small abscess in the right putamen. H.-E. ×110. B Candida in yeast and mycelial form in putaminal abscess. PAS ×1200