SUICIDE BY INSULIN INJECTION IN COMBINATION WITH β-BLOCKER APPLICATION.

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Contents

Abstract

A 68 year old non-diabetic physician with a known psychiatric history was found dead in his home. The death scene investigation revealed 3 used insulin syringes on the coffee table next to the body. The autopsy and the consecutive chemical-toxicological investigation revealed that the deceased committed suicide by injecting an overdose of insulin in combination with a high therapeutic oral bolus application of a β-blocker (Metoprolol). A surprising morphological finding was a terminal pulmonary thrombembolism in the right pulmonary artery.

Keywords

suicide; insulin; β-blocker; pulmonary thrombembolism; hypoglycemia, lethal

1 Introduction

A suicide attempt using an insulin overdose carries the risk of survival with hypoglycemic brain damage. β-blockers were long said to mask the symptoms of hypoglycemia by a blockade of catecholamine-mediated counterregulation and antagonism of the adrenergic warning signs [1]. Up to last year the subscription of β-blockers to an insulin dependent diabetic subject was a classical professional error [2]. The combination of the two drugs was supposed to be a 'safer' method of suicide due to the masking of the hypoglycemic symptoms during the long mortal agony.

A re-evaluation of the theoretic interaction of β-blockers and insulin in real life situations changed this perception. Both drugs can now be used in the same subject with nearly no interaction between the two [2, 3].

2 Case Report

A 68 year old physician with a known history of depressive illness but no other physical or internal ailments used insulin in conjunction with β-blockers (Metoprolol) to shorten his life. He left a note indicating his intention to do so. Due to his mental condition he was unable to continue his work.

He was found dead on a couch in his flat by his estranged wife (Fig. 1).

On arrival of the emergency medical team 3 empty disposable syringes and an empty ampoule of insulin were found on the coffee table. The content of the syringes was later analysed to be human insulin.

Toxicological Analysis

A blood screening for drugs as well as substances of abuse was performed. A high therapeutic level of the β-blocker Metoprolol ($0.4\mu g/ml$, therapeutic range 0.035-$0.5\mu g/ml$) was found.

Furthermore a moderate alcohol intoxication was diagnosed with levels of $122mg/dl$ in blood, $1.97mg/dl$ and $1.66mg/dl$ in urine and aqueous humour, respectively.

In order to verify the external application of insulin the blood insulin level and the blood C-peptide level were determined as well as the insulin and C-peptide levels in liquor and aqueous humour.

The insulin molecule is made out of two strands of amino acids connected by disulfur bridges. The structure of the molecule is achieved by cleavage from a single strand, dumping the intermittend strand, the so called C-peptide [4]. In synthetically produced insulin for use by diabetics no C-peptide can be found.

During all measurements the C-peptide value was below the measurement threshold ($0.5\mu U/ml$), indicating external application. Serum insulin level was 1848,$8\mu U/ml$, compared with a normal values $<15.6\mu U/ml$ on an empty stomach. Liquour and aqueous humour insulin levels were $6.9\mu U/ml$ and $0.4\mu U/ml$ respectively.

Autopsy Findings

During autopsy a fulminant embolism of the right pulmonary artery was diagnosed. Histological examination demonstrating an acute embolisation with no attachment to the wall of the pulmonary artery (Fig.2). The source of the embolus could be pinpointed to the calfes were further old thrombi were found on both sides.

$6cm$ to the right and left of the navel a total of 3 fresh subcutaneous injection sites were found. Serial microscope slices of the injection sites exhibited bleeding in the needle channel as well as an interstitial edema (Fig.3). Due to the poor state of the specimens no attempt was made to perform immunhistological staining at the injection site [5].

3 Discussion

The symptoms of acute hypoglycemia can be divided into two categories: those induced by excessive secretion of epinephrine/norepinephrine (autonomic response) and those due to dysfunction of the central nervous system (neuroglycopenia response) [3, 7, 8].

Rapid epinephrine release causes sweating, tremor, tachycardia, anxiety, and hunger.

Central nervous symptoms consist of prolonged hypoglycemia and include dizziness, headache, clouding of vision, blunted mental acuity, loss of fine motor skills, confusion, abnormal behavior, convulsions, and loss of consciousness.

With rapid onset of hypoglycemia autonomic symptoms are prominent, though in diabetic subjects autonomic symptoms may not be manifest if neuropathy is present. The symptoms of the neuroglycopenia response will follow those of the autonomic response [9, 10].

In the presented case the serum insulin level is much higher than the levels normally found in insulin suicide victims [6]. It is most likely that convulsions resulted in the detachment of the organized thrombi in the calfes leading to the fresh embolism of the right pulmonary artery.

The lung embolism shortened the long agony normally associated with death by hypoglycemia though death was inevitable in this case [3, 11].

Figure 1: Death Scene.

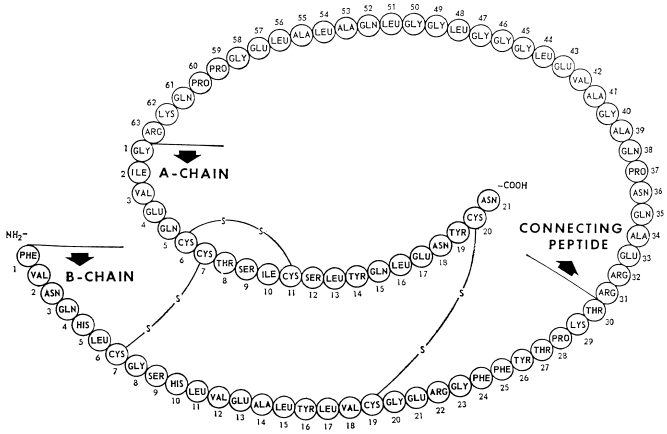

Figure 2: Primary structure of human proinsulin. Modified from Chance[4].

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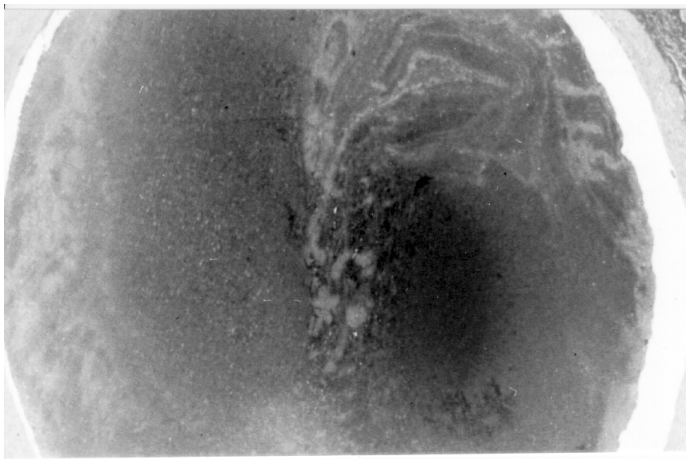

Figure 3: Embolus in the right pulmonary artery. HE staining.

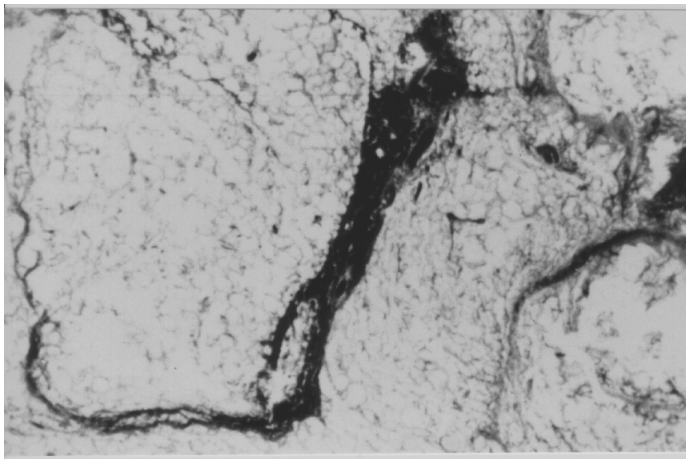

Figure 4: Subcutaneous tissue showing the injection channel of one of the 3 insulin application sites. HE staining.