with diabetes [3]. Consequently, in order to ensure an adequate insulin supply method for patients, after a sentinel weather event, we developed a UAV delivery solution using a vertical take-off and landing (VTOL) Wingcopter 178 drone which we operated under beyond visual line of sight (BVLOS) conditions. After a lengthy planning process, we ensured compliance with all Irish (European) Aviation Aerospace regulations. In addition we complied with regulations surrounding the dispensing of prescribed fridge medications. We had our maiden flight on September 13, 2019 from Galway, Ireland to the Aran Islands (20Km each way) delivering insulin from the pharmacist to the patient's clinician. This represents the first documented autonomous delivery of insulin for a patient with diabetes.

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Cardiovascular Endocrinology

HYPERTRIGLYCERIDEMIA; INFLAMMATION AND MUSCLE METABOLISM IN OBESITY AND WEIGHT LOSS II

Ketone Bodies in Critical Illness Alter Cholesterol Synthesis in Skeletal Muscle, Interlinked with Protection Against Weakness

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Background: Critically ill patients often develop muscle weakness, which hampers recovery. In septic mice, supplementing parenteral nutrition (PN) with ketone body 3-hydroxybutyrate (3HB) attenuated muscle weakness, but also normalized sepsis-induced low cholesterol[1]. As 3HB can be metabolized into cholesterol, we hypothesized that improved muscle function with 3HB was related to altered cholesterol metabolism. **Methods**: In a catheterized, fluid-resuscitated, antibiotics-treated mouse model of prolonged sepsis (cecal ligation and puncture), septic mice received PN supplemented with either D,L-3HB sodium salt (PN+3HB; 150 mg/day) or isocaloric glucose (PN+gluc) and healthy pair-fed mice served as controls (n=15-17 mice/group). After 5 days, *ex vivo* muscle force and markers of cholesterol metabolism were assessed. In 600 weak and non-weak human critically ill patients (weakness assessed on day 8±1 in ICU by MRC sum score), serum total cholesterol concentration was measured on ICU day 3 or last day for shorter stayers. **Results**: In mice, PN+3HB counteracted the sepsis-induced lowering of plasma cholesterol (p=0.04), which correlated positively with absolute muscle force (R^2=0.19, p=0.002). Plasma mevalonate concentration, a surrogate marker of cholesterol synthesis, was reduced by sepsis (p=0.03 vs. controls), but normalized by PN+3HB (p=0.001 vs. PN+gluc). Skeletal muscle expression of cholesterol synthesis genes *Srebf2, Hmgcr* and *Hmgcs1* was higher in PN+3HB than in PN+gluc septic mice (p≤0.01). Expression of cholesterol uptake receptor *Ldlr* was also increased in PN+3HB septic mice (p=0.02 vs. PN+gluc), whereas PN+3HB did not affect cholesterol efflux transporters. In contrast, PN+3HB did not alter sepsis-induced alterations in markers of hepatic cholesterol metabolism. Plasma concentration of ubiquinone, a central co-factor of the mitochondrial respiratory chain derived from mevalonate, was increased by sepsis, irrespective of PN+3HB (p<0.0001 vs. controls) and PN+3HB could not counteract sepsis-induced muscular mitochondrial dysfunction (p≤0.0009 vs. controls). This excludes the involvement of ubiquinone in muscle weakness attenuation by 3HB supplementation. However, higher muscular *Nceh1* expression was observed with PN+3HB (p≤0.04 vs. controls and PN+gluc), suggesting enhanced shuttling of newly formed free cholesterol to the membranes. In human ICU patients, lower serum cholesterol concentration was observed in weak vs. non-weak patients (p=0.0002). In a multivariate model adjusted for baseline risk factors, low serum cholesterol concentrations were independently associated with muscle weakness (p=0.05). **Conclusion**: 3HB supplementation of PN enhanced muscle cholesterol synthesis and increased plasma cholesterol, which appeared to independently protect against sepsis-induced muscle weakness. 1 Goossens et al. (2019). Crit Care. 23: 236.

Diabetes Mellitus and Glucose Metabolism

DIABETES COMPLICATIONS II

Association of Sleep Quality and Painless Diabetic Peripheral Neuropathy in Type 2 Diabetes

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Abstract

Aims

Diabetic peripheral neuropathy (DPN) is one of the most common and early manifested complication in T2D. Previous reports have shown that painful sensation of diabetic peripheral neuropathy (DPN) results in sleep problems in type 2 diabetes (T2D)[1, 2]. However, it is not known that subtype of DPN, the painless DPN also is associated with poor sleep quality in T2D. The purpose of the current study was to investigate the association between painless DPN and poor sleep quality in T2D.

Methods

A total of 146 patients of T2D who did not previously diagnose with symptomatic DPN were recruited into the study. Among the patients, painless DPN was diagnosed by using the current perception threshold (CPT) test. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI) questionnaire.

Results

The percentage of painless DPN was significantly higher in the poor sleep quality group than the good sleep quality