hyperfunctional TAP,[10] but screening for hypersecretion of catecholamines is still recommended.[1]

The coexistence of other paragangliomas in a patient with TAP occurs in 9%–14% of cases, the most likely location being in the carotid body and/or along the vagus nerve. Computerised tomography or magnetic resonance imaging of the neck, chest, abdomen and pelvis or positron emission tomography with ^{18}F-DOPA, or even better if possible with ^{68}Ga-DOTA, is therefore recommended to identify these lesions and avoid confusing them with metastases or postoperative recurrences.[1–3,5,11]

^{123}I/^{131}I-metaiodobenzylguanidine (MIBG) and ^{111}In-pentetreotide (octreoscan) scintigraphy scans are no longer recommended for this purpose due to their poorer diagnostic efficacy.[11]

At least 30% of paragangliomas located in the head and neck are thought to be caused by a germline mutation. In these cases, multiplicity, malignancy and association with other tumours such as pheochromocytomas are more common.[3] Study for mutations in the succinate dehydrogenase genes is recommended,[2,3] especially if the immunohistochemical staining is negative for succinate dehydrogenase B, as this indicates that some mutation may be present.[8]

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Authorship

Luis García Pascual: conception of the study, data acquisition and analysis, interpretation of results, writing of the draft and approval of the final version.

Clarisa González Mínguez: data acquisition and analysis, critical review of the draft and approval of the final version.

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Treatment of hyperglycaemia during hospitalization and its association with inpatient mortality☆

Hiperglucemia durante los ingresos y su asociación con la mortalidad hospitalaria

Hyperglycaemia is a common problem in the hospital setting and both stress-induced hyperglycaemia (SIH) and diabetes mellitus (DM) have been recognised as markers of morbidity and mortality.[1–4] However, there is a lack of consensus on the association between an inpatient's blood glucose disorders and their prognosis, depending on the population studied.[5,6]

In order to assess how the hyperglycaemia factor impacts on hospital mortality, we carried out a descriptive observational study that included adult patients admitted for any cause from 1 June 2014 to 31 May 2015 in a high-complexity hospital in Argentina (Hospital Italiano de Buenos Aires, which has a total of 750 beds, including 200 critical care beds for intermediate care, intensive care and coronary care units). Patients were followed up from admission to discharge or death, using the Cox proportional hazards model to estimate the overall risk coefficient for death. Univariate hazard ratio (HR unchanged by confounding factors) and multivariate hazard ratio (HRa, adjusted for different confounding factors) are reported, with their respective 95% confidence intervals.

All clinical and administrative information was collected and stored in a single centralised repository of computerised data accessible through the electronic medical record (EMR), from where we obtained the secondary retrospective data for the purposes of this project, after approval by the institution's ethics committee. We asked for all blood glucose values (including fasting or random determinations) and all capillary blood glucose values taken during admission.

The overall cohort consisted of 14,938 patients, with a mean age of 64 years (12.86% [1921]), a previous diagnosis of DM and a high preva-

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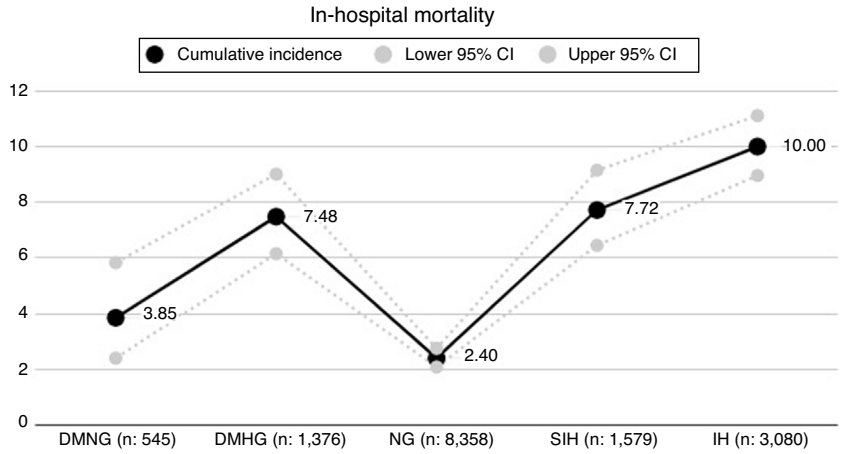

Figure 1 Cumulative incidence of mortality according to blood glucose patterns.

lence of associated cardiovascular comorbidity (25.45%), which was defined by reviewing the EMR as a construct consisting of a history of at least one of the following: acute myocardial infarction, established coronary disease, heart failure, peripheral vascular disease and/or chronic kidney failure. Most were patients on a general inpatient ward who did not require transfer to intensive care (69.93%) and were unscheduled admissions (52.80% admitted by the emergency department), with a median hospital stay of 4 days (interquartile range of 5.7).

According to the blood glucose pattern and defining all patients whose records showed all of their measurements lower than 140 mg/dl as being normoglycaemic (NG), we identified five groups: diabetes with normoglycaemia (DMNG: 545), diabetes with hyperglycaemia (DMHG: 1376), normoglycaemia without DM (NG: 8358), stress-induced hyperglycaemia (SIH: 1579) and indeterminate hyperglycaemia (IH: 3080).[7] Hypoglycaemia, defined as at least one value <70 mg/dl, occurred with a frequency of 5.86% (875) in the global cohort (of these, 30% received corrective insulin regimen during admission and 10% basal insulin), 4.58% (25) in the DMNG group and 10.53% (145) in the DMHG group.

During the follow-up of this cohort, a total of 755 deaths occurred, resulting in a cumulative incidence of overall in-hospital mortality of 5.05%. In the different groups considered, the mortality rate was 3.85% (95% CI: 2.40–5.83) in DMNG, 7.48% (95% CI: 6.15–9.01) in DMHG, 2.40% (95% CI: 2.08–2.75) in NG, 7.72% (95% CI: 6.45–9.15) in SIH and 10% (95% CI: 8.96–11.11) in IH (Fig. 1).

Taking the NG group as the baseline reference, the risk coefficients without modification by confounding factors were: HR 1.84 (95% CI: 1.17–2.89) in DMNG, HR 1.75 (95% CI: 1.38–2.23) in DMHG, HR 1.30 (95% CI: 1.03–1.64) in SIH and HR 1.84 (95% CI: 1.54–2.22) in IH, with no significant differences between the different hyperglycaemic groups. In turn, the risk of mortality adjusted for potential confounders (gender, age, hypoglycaemia, surgery, transfer to the intensive care unit, cause of admission, cancer and cardiovascular comorbidity) according to blood glucose pattern yielded: HRa 1.19 (95% CI: 0.76–1.87) in DMNG, HRa 1.53 (95% CI: 1.20–1.96) in DMHG, HRa 1.31 (95% CI: 1.03–1.67) in SIH and HRa 2.01 (95% CI: 1.66–2.43) in IH.

It would have been of interest to have other important variables to adjust, such as the proportion of patients who were on hypoglycaemic drug treatment before admission, or some marker of severity/prognosis of critically ill patients (such as APACHE score). However, this was not possible due to the inherent characteristics of the design, as retrospective data collection depends on the availability and quality of data recording in the EMR. It was also not feasible to collect detailed information on the characteristics of patients with DM (e.g. years since onset of DM, presence or absence of associated microvascular or macrovascular complications, number of prescribed drugs, previous metabolic control and insulin treatment prior to admission). This information is important for interpreting the findings, since diabetes is a chronic disease affecting a very heterogeneous group of individuals.

Nevertheless, some of the main strengths of the study include the following: (a) the quality of information is based on computerised and reliable data, and the institution has level 7 accreditation from the Healthcare Information and Management Systems Society; (b) it is a high complexity, national referral hospital, so the results could be extrapolated to other institutions or similar populations. Although still an observational, retrospective study, the large sample size provided us with conclusive results to explore how this factor (hyperglycaemia as an independent variable) impacts an outcome (in-hospital death as a dependent variable). Moreover, it is important to mention that the group with IH, often excluded in other studies, turned out to contain the highest number of people with hyperglycaemia.

With different studies reporting inconsistent findings,[8,9] our results provide more in-depth data on a factor linked to increased hospital mortality of great clinical importance. In conclusion, our results support the idea that the presence of hyperglycaemia during admission is associated with an increase in hospital mortality, regardless of the diagnosis of DM. However, it does not allow us to conclude whether the diagnosis of DM *per se* has any influence on mortality in this setting.[10]

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Conflict of interest

The authors declare that they have no conflicts of interest.

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