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BRIEF REPORT

Study of drug dose calculation for morbidly obese patients☆

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KEYWORDS
Morbid obesity;
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Abstract
Introduction: The objective of this study is to analyse the appropriateness and characteristics of drug dose calculation for hospitalised, morbidly obese patients.
Methods: Retrospective, descriptive study of dose calculations for drugs prescribed to hospitalised, morbidly obese patients in a tertiary hospital in 2007. The recommendations prepared by the Pharmacy division are used as a standard.
Results: We included 62 patients. The mean number of medications prescribed per patient was 12.1 (4-39), and an average of 2.4 (1-10) are listed in the recommendations. A total of 135 drugs were prescribed. Dose calculations for 81 of the above (60%) coincided with recommendations and 54 (40%) did not; there were 51 cases of underdosing and three cases of overdosing.
Discussion: Improper dosing was detected for prescriptions in the systemic antibiotic and antithrombin drug groups, with underdosing being more common than overdosing.

☆The preliminary results of this study were presented on the 53rd Spanish National Congress of the Spanish Society of Hospital Pharmacy and the 1st Latin American Meeting of Hospital Pharmacists.

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PALABRAS CLAVE
Obesidad mórbida;
Obesidad;
Dosificación de fármacos;
Medicamentos;
Recomendaciones

Estudio de la dosificación de fármacos en los pacientes con obesidad mórbida

Resumen
Introducción: El objetivo del trabajo es analizar la adecuación de la dosificación de los fármacos en los pacientes hospitalizados con obesidad mórbida y sus características.
Métodos: Estudio retrospectivo y descriptivo de la dosificación de los fármacos prescritos a los pacientes hospitalizados con obesidad mórbida en un hospital de tercer nivel durante el año 2007. Se ha utilizado como estándar las recomendaciones elaboradas por el servicio de farmacia.
Resultados: Se incluyó a 62 pacientes. La media de las especialidades farmacéuticas prescritas por paciente fue 12,1 (4-39), y 2,4 (1-10) la de los fármacos incluidos en las recomendaciones, con un total de 135 especialidades prescritas. La dosificación de 81 (60 %) de ellas coincidía con las recomendaciones y 54 (40 %) no; en 51 casos fue por infradosificación y en 3, por sobredosificación.
Discusión: Se detecta dosificación inadecuada de los fármacos prescritos de los grupos antibióticos sistémicos y antitrombóticos, con predominio de la infradosificación.

Introduction

Obesity is a complex chronic illness which is increasing in western countries with the characteristics of an epidemic illness.[1]

The prevalence of obesity in the adult population aged 25-64 years is estimated to be 15.5%, and is greater in women (17.5%) than in men (13.2%). Morbid obesity[2] is found in 0.3% of men and 0.9% of women in the age range from 25 to 60 years, although there are Spanish populations with a much greater rate of morbid obesity, close to 3%.[1] In the majority of the studies on adults in Spain, the prevalence of obesity was greater in women and increased with age, especially among less-educated women.[2]

The classification of obesity using the body mass index (BMI) is shown in Table.[3]

Obesity produces a series of physiological changes that affect the pharmacokinetics and the pharmacodynamics of numerous drugs, especially those which have a narrow therapeutic margin and those which require minimum plasma concentrations to be effective.[3] For those drugs whose doses are calculated as a function of weight it is important to know which is the most adequate weight among those which may be used: ideal, adjusted or total weight, since the dose administered as a function of different weights with morbid obesity may vary substantially and lead to toxicity or therapeutic inefficiency.

There are several studies and guides about the dosage of drugs in extreme ages—such as newborns, children, and elderly people—as well as certain physiopathological situations—renal and liver failure—. However, there are few studies in obese patients, and even less in those with morbid obesity. The majority of these studies have been carried out by physicians specialized in anaesthesia and reanimation in ICU.[4-6]

Due to the scarce and sometimes contradictory information, the pharmacy division developed some recommendations for the dosage of drugs used in morbid obesity.[3]

The objective of this study was to analyze the adequacy of dosage in patients hospitalized for morbid obesity and the characteristics of these patients.

Methods

This is a retrospective descriptive study in a tertiary hospital during 2007 of the dosage of the drugs prescribed for patients hospitalized with morbid obesity, using the recommendations elaborated by the pharmacy division as a standard.[3]

To select the patients, the clinical documentation department gave us the list of patients discharged in this period whose diagnosis at the moment of discharge included morbid obesity (code 278.01 of the International Classification of Diseases [ICD-9-CM]).[7] We excluded patients whose height and weight were not available in the clinical record.

We designed a form for data of individuals in which we recorded the dates of admission and discharge, patient information (record number, sex, age, weight, height, BMI, diagnosis at discharge, analyses with values of serum

Table Classification of obesity according to body mass index (BMI) according to the Spanish Society for the Study of Obesity (SEEDO)

Category	Body mass index
Normal	18.5-24.9
Overweight grade 1	25-26.9
Overweight grade 2 (pre-obesity)	27-29.9
Obesity type 1	30-34.6
Obesity type 2	35-39.9
Obesity type 3 (morbid)	40-49.9
Obesity type 4 (extreme)	≥50

creatinine and creatinine clearance), total number of prescribed specialty drugs, the number of specialty drugs included in the recommendations and whether the dosage coincided with the recommendations. In case it did not coincide, it was studied whether it was because of over or underdose. We used the drug form rather than the drug specialty to express the results.

We excluded from the study: fluid therapy, intravenous electrolytes, drugs used to induce anaesthesia and those whose dose or interval of administration were adjusted according to the degree of renal failure, since these adjustments made it difficult to determine the dose accurately.

We used several books and guides about the use of drugs[8-13] to obtain data, as well as the following programs and formulas:

- Hospiwin program (Baxter), with the Prescriwin application: drugs prescribed during the admission process.
- Surgery and reanimation records: doses of drugs prescribed during surgery.
- HP Doctor (Hewlett-Packard): to obtain the discharge report of the patient and the time in the ICU.
- Salazar-Corcoran equation: calculation of creatinine clearance in obese patients.

We also included information on bemiparin not included in the recommendations.[3] Prophylaxis: 3500 U/day.[14,15] Treatment: 115 U/kg total weight/day.[16]

Results

We obtained data of 145 patients discharged with a diagnosis of morbid obesity; 45 were excluded due to lack of data on height and weight. Other reasons for exclusion included: four were to non applicable admissions (cancellation of surgery), 27 had BMI <40 at admission and 7 lacked information about the drugs prescribed in the recommendations. Thus 62 patients were selected for the study.

The mean age was 25 (23-83) years, with more women than men, 40 and 22, respectively, and a mean BMI of 48 (40-68).

Sixty-eight percent of the patients had type 3 (morbid) obesity, while 32% had type 4 (extreme) obesity.

The distribution of patients in the different departments was: thirty-three in surgery departments and 29 in medical departments, as shown in Figure 1.

Twenty percent of the drugs prescribed to the patients with morbid obesity had specific recommendations for their dosage.

The mean number of specialized drugs prescribed per patient was 12.1 (4-39), and the mean of the specialized drugs included in the recommendations was 2.4 (1-10). Their total number was 149, of which 14 were excluded because the dosage or interval of administration was adjusted for renal failure.

Of the 135 specialized drugs analyzed, 67 were of the antithrombotic therapy group, 53 were systemic antibiotics, 11 were systemic corticoids, 2 for heart therapy, 1 hypnotic sedative, and 1 opiate analgesic (Figure 2).

Of the 135 specialized drugs analyzed, 102 have recommended dosage according to maximum doses, 17 according to total weight, 12 according to adjusted weight, 3 according to ideal weight, and 1 according to standard dose.

Of the 135 specialized drugs analyzed, the dosage of 81 (60%) coincided with the recommendations and 54 (40%) did not; 51 cases because of underdose and 3 because of overdose.

Underdose was present in 94% of the specialty drugs dosed as a function of total weight, in 25% of those dosed by ideal weight and in 10% of those dosed by adjusted weight.

In the group of antithrombotic drugs, 90% enoxaparin and 100% bemiparin were underdosed for the treatment of deep vein thrombosis (DVT). Seventy-seven percent bemiparin had the correct dosage for the prophylaxis of DVT. In the group of systemic antibiotics, 80% levofloxacin and 70% amoxicillin-clavulanic acid were underdosed when used for treatment. Sixty percent antibiotics were underdosed when used for surgical prophylaxis, especially vancomycin with a dose of 1 g in 100% of the cases, and cefuroxime with a dose of 750 mg in 43%

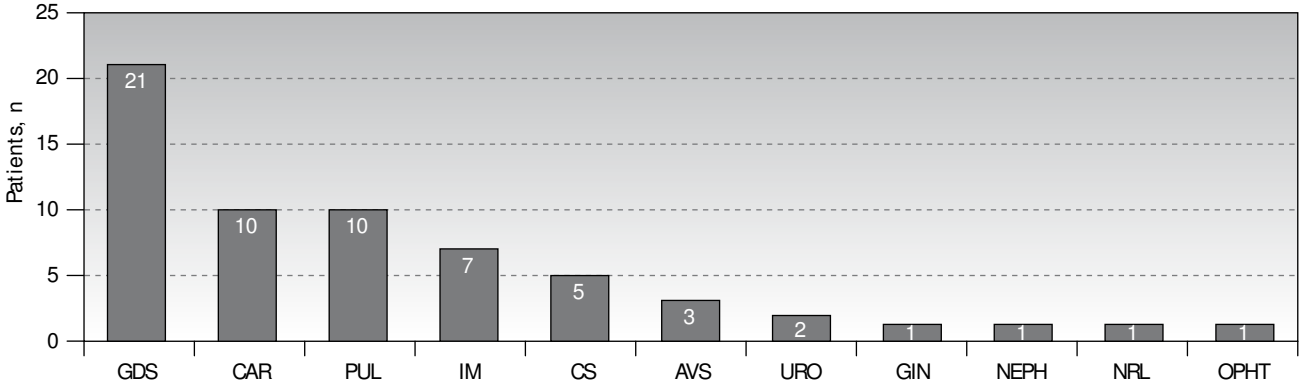

Figure 1 Distribution of patients by surgical department. Surgical departments: AVS indicates angiology and vascular surgery; CS, cardiac surgery; GDS, general and digestive surgery; GIN, gynecology; OPHT, ophthalmology; URO, urology. Medical departments: CAR indicates cardiology; IM, internal medicine; NRL, neurology; PUL, pulmonology.

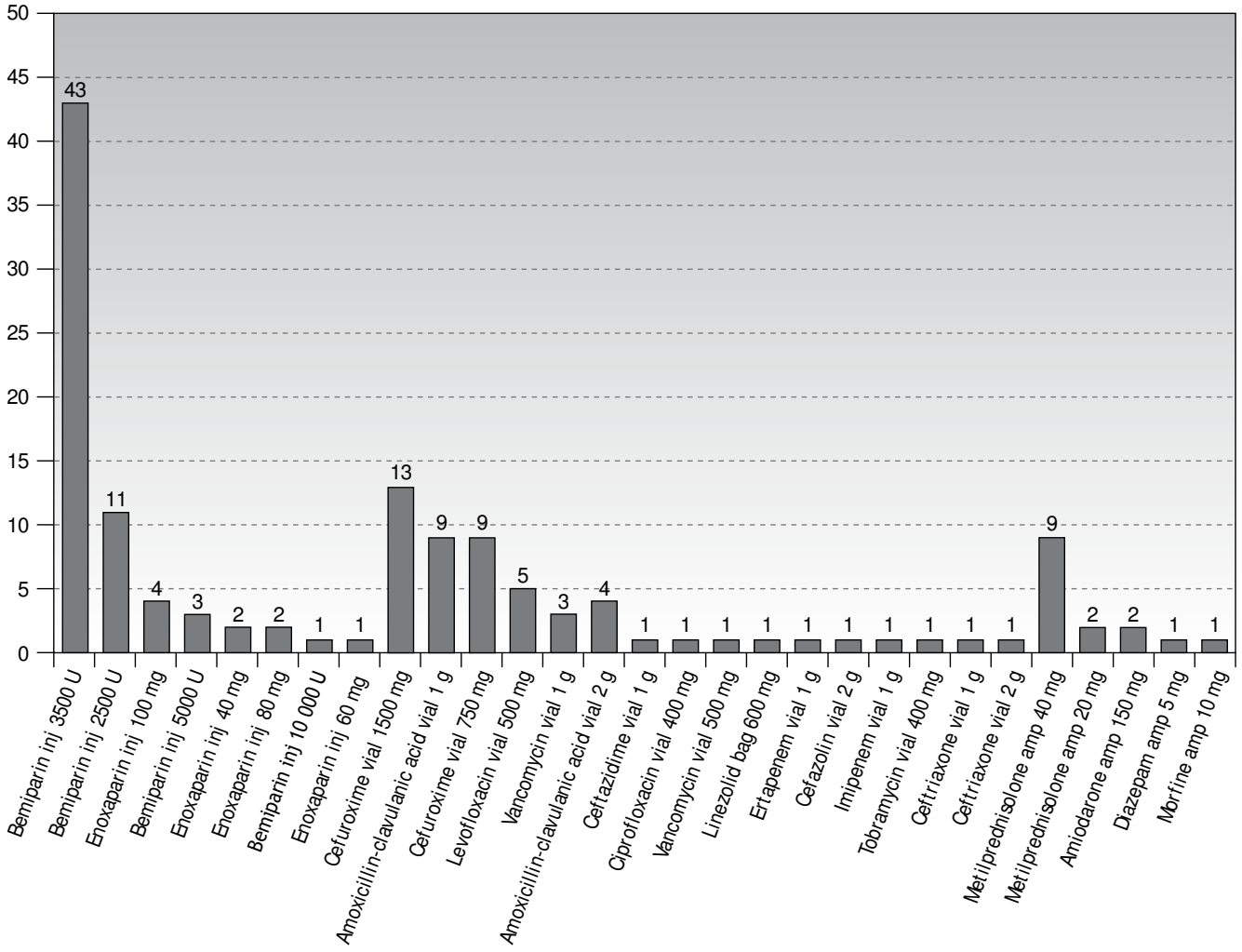

Figure 2 Drug forms of the therapeutic groups analyzed.

Discussion

The pharmacological treatment of the morbid obese patient is especially complex due to the limited information, variability and dispersion, which was confirmed by this study. We observed an inadequate dosage of the drugs with recommendations, especially in the systemic antibiotics and antithrombotics, in which underdosage predominated.

This inadequate dosage was observed both in treatment and in prophylaxis. In the latter case, when an extra dose of a prophylactic antibiotic needed to be administered, half of the dose was given (500 mg of vancomycin, 750 mg of cefuroxime, and 1 g of amoxicillin-clavulanic acid), while it is recommended that the prophylactic dose be the same as the treatment dose.[13]

We cannot contrast the data of this study with those of other authors, since there are no similar studies of the dosage of drugs in patients with morbid obesity.

One limitation of this study is that we did not obtain data from certain departments, such as orthopaedic surgery, traumatology, and the ICU.

Furthermore, there was a considerable number of patients classified as morbid obese with incomplete data on height and weight (45) and with a BMI <40 (27); this information could not be included.

Another possible limitation is the omission of the morbid obesity code by the clinical documentation department.[17]

The reduced number of patients is also worth mentioning; more studies will be necessary to corroborate our results. However, this study gives a baseline idea of the dosage of drugs in this type of patients, and what should be improved.

Obtaining an adequate dosage of the drugs in this type of patient represents an opportunity for improvement in the pharmacotherapeutic care by physicians, facilitated by new technologies and in the near future with programs of assisted prescription in which by entering the height and weight one may obtain the BMI, and thus recommend the most adequate dosage.

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