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ORIGINAL ARTICLE

Cross-over clinical trial for evaluating the safety of camel's milk intake in patients who are allergic to cow's milk protein

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Abstract
Background: Cow's milk protein allergy (CMPA) affects between 0.6 and 0.9% of the general population, and its treatment implies the total elimination of the intake of this protein. Camel's milk has been suggested as an alternative for patients over one year of age who suffer from CMPA due to the difference in the amino acid sequence from that of cow's milk. The objective of this study was to evaluate the safety and tolerability of camel's milk in children with CMPA.
Methods: Crossed clinical trial for the use of camel's milk vs. amino acid formula, carried out at the Dr. Federico Gómez Children's Hospital of Mexico (HIMFG) on patients between one and 18 years of age with diagnosed CMPA confirmed through double-blind, placebo-controlled food challenges (DBPCFCs). Only those whose allergies were confirmed were randomly placed into two groups: those to be administered camel's milk and those to be administered the amino-acid formula for two weeks, followed by a six-week wash-out period, and then a group crossing for a further two weeks.
Results: 49 patients with suspected CMPA were included in the study; the diagnosis was confirmed through DBPCFCs in 15 patients, who were those who participated in the study. After having been administered camel's milk, none of the patients presented adverse effects.
Conclusions and clinical relevance: Camel's milk is safe and tolerable in patients above one year of age with CMPA and can be considered as a good alternative given the benefit of its taste compared to other formulas.

Abbreviations: CMPA, cow's milk protein allergy; HIMFG, Hospital Infantil de México Federico Gómez; DBPCFC, double-blind, placebo-controlled food challenge.

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Introduction

Cow's milk protein allergy (CMPA) affects between 0.6 and 0.9% of the general population, and is a public health issue that mainly affects the paediatric population.[1,2] Although the diagnosis of CMPA is not simple, we know that double-blind, placebo-controlled food challenges (DBPCFCs) continue to be the gold standard for its diagnosis, especially in research studies.[2–4] Current treatment for CMPA today implies totally eliminating the intake of the protein, which in most cases represents a huge challenge for the family and attending physicians.[5–7]

Whenever prescribing a diet free from cow's milk protein, it must be nutritionally adequate, which is why the objective is to reach a protein–calorie balance with an adequate amino-acid composition, as well as a proper source of calcium. It is necessary to complement the diet of children under the age of one with an extensively hydrolysed or amino-acid formula,[8] however, low organoleptic acceptance, understood as the sensory perception of the physical qualities of matter, greatly limits the use of these formulas, as does adherence; furthermore, it has been noted that the smaller the amount of administered protein, the worse the flavour.[9]

After the first year of age, introducing solid foods into the baby's diet avoids the need for cow's milk protein.[8] Formulas that are extensively hydrolysed with casein and whey, as well as amino acids, are designed for children under the age of one, acting as a substitute for cow's milk protein; after this first year of life, this protein is no longer necessary for their diet.[8] However, it has been proven that children over the age of one who have restrictions regarding this product and its derivatives, absorb less protein and calories over all, even when aided by nutritionists.[10] Cow's milk is highly consumed not only in Mexico, but around the world. According to the Mexican Secretariat of Economy and the General Directorate for Basic Industries, in 2010, 97 litres of cow's milk were consumed per inhabitant per year in Mexico,[11] without taking into account that a significant amount of processed food contains cow's milk protein as a base ingredient.[12,13]

Camel's milk has been proposed as an alternative for patients who suffer from CMPA because of its different amino-acid sequence; furthermore, it presents low quantities of β casein (Bos d8) and no β lactoglobulins (Bos d5),[14] and is adequately nutritionally balanced with essential components such as lactoferrin, immunoglobulins, lysozyme, and vitamin C[15] (Table 1).

Various authors have tried to test the tolerability of camel's milk on patients who are allergic to cow's milk protein, and have obtained favourable results; however, it is worth considering that most of these studies evaluate the tolerability of camel's milk in open trials, which could skew the results.

The objective of our study was to evaluate the safety of administering camel's milk to paediatric patients over the age of one with CMPA.

Materials and methods

A cross-over clinical trial was carried out at the Dr. Federico Gómez Children's Hospital of Mexico (HIMFG), from January to December 2016, to compare the safety between administering camel's milk vs. amino-acid formula on children diagnosed with CMPA. Patients from 1 to 18 years of age with suspected CMPA – understood as the presence of respiratory, cutaneous, gastrointestinal or nasal symptoms associated with the intake of cow's milk protein – were included in the initial study. Patients with allergies from other food sources were excluded from the study, as well as those under the treatment of immunosuppressive drugs, systemic steroids, antihistamines and anti-leukotrienes. None of the patients suffered from any concomitant chronic illnesses, except from rhinitis or asthma; notwithstanding, adequate symptom control was carried out when participating in the trial.

This trial was approved by the Ethics and Biosafety investigation committees at HIMFG (protocol number HIM/2016/006).

All patients, with prior informed consent, underwent a full medical evaluation by a certified paediatrician, including medical records and a physical examination. The first step was to confirm the diagnosis of CMPA by carrying out a DBPCFC with the cow's milk protein; in accordance with international guidelines on the matter,[23] patients underwent a strict cow's milk protein elimination diet over six weeks with previous supervision and education regarding food that could contain the ingredient and label reading. At the end of these six weeks, a placebo or lactose-free milk was administered on two separate days, with dosage levels progressing every 30 min, until reaching a volume of 240 ml. The presence of abdominal, cutaneous, respiratory and nasal symptoms was monitored, and results were considered positive when objective symptoms were present, or subjective symptoms in three consecutive doses, and worsened or persisted after 40 min.[24]

Having confirmed the diagnosis of CMPA, medical advice was newly given concerning the elimination diet and patients were summoned six weeks later. During this six-week period, patients were randomised by a random numbers generator which balanced out segments of five patients in one of two groups: one to be administered camel's milk and the other an amino-acid formula in accordance with Table 2. Neither the doctors in charge of administering and monitoring, nor the patients nor family members knew what the trial was about. Patient monitoring was carried out according to the times specified in Table 2 at the hospital, in case of the presence of abdominal, cutaneous, respiratory and nasal symptoms. Results were deemed positive when objective symptoms were present, or subjective symptoms present in three consecutive doses, and worsened or persisted after 40 min.

In case of negative results throughout this period of hospital monitoring, patients would be released and given enough formula/milk so as to ingest 200 ml per day over seven days. At the end of the intervention, an intermediate six-week cleansing period was given, in which neither intervention (formula or milk) was administered. The groups were then switched, so as to carry out the same procedure with the other intervention. Daily follow-up was given over the phone during these two weeks, and at the end of the whole process a physical examination was carried out by a paediatric allergist.

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