ARQUIVOS DE ASMA, ALERGIA E IMUNOLOGIA

Sensitization to poultry meat, fish, and coconut in a multiple food allergic young boy

Sensibilização a carne de aves, peixe e coco em um jovem com alergia alimentar múltipla

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ABSTRACT

Poultry meat allergy is rare and may present as primary or secondary, in the context of bird-egg syndrome. Chicken meat is responsible for most of the reactions. Cross-reactive allergens (parvalbumins, enolases, aldolases) between fish and chicken meat have been described. Coconut allergy is also rare. Coc n2 (7S globulin) and Coc n4 (11S globulin) have been implicated. We present a complex multiple food allergy case report where investigation into fish and chicken meat allergies as well as coconut allergy is carried out.

Keywords: Food hypersensitivity, foods containing coconut, fish proteins, immunoblotting, poultry proteins.

RESUMO

A alergia à carne de aves é rara e pode apresentar-se como primária ou secundária, no contexto da síndrome ovo-ave. A carne de frango é responsável pela maioria das reações. Foram descritos alergênios com reação cruzada (parvalbuminas, enolases, aldolases) entre peixe e carne de frango. A alergia ao coco também é rara. Coc n2 (globulina 7S) e Coc n4 (globulina 11S) foram implicados. Apresentamos um relato de caso complexo de alergia alimentar múltipla, onde é realizada investigação sobre alergia a peixe e carne de frango, bem como alergia ao coco.

Descritores: Hipersensibilidade alimentar, alimentos de coco, proteína de peixe, immunoblotting, proteína de aves domésticas.

Introduction

Poultry meat allergy is rare and may present as primary or secondary, in the context of bird-egg syndrome. Chicken meat is responsible for most reactions.[1,2] A new clinical syndrome has recently been described involving cross-reacting allergens between fish and chicken meat (fish-chicken syndrome), mainly parvalbumin.[2-4] Coconut allergy is also rare, although it has been increasing in the last few years due to the widespread use of coconut oil and milk in cooking and skin care products. Coc n 1 (7S globulin) and Coc n 4 (11S globulin) have been described as its main allergens.[5,6]

Case report

We report the case of a 16-year-old boy, referred to us for consultation because of multiple food allergy. Symptoms started when the boy was 8-10 years old after fish ingestion (abdominal pain, vomiting, oropharyngeal pruritus, facial erythema, and lip angioedema), first with salmon and then with codfish, horse mackerel, sea bass, and canned tuna.

At the age of 15, the patient started to present multiple other food reactions. He experienced several anaphylactic reactions to poultry meat, first with chicken meat and then with turkey and duck meat, characterized by facial pruritus, lip angioedema,

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laryngeal tightness, abdominal pain, and diarrhea. He had always tolerated hen's eggs. However, he had been exposed to domestic birds from 2-3 and from 11-12 years of age and there were pigeon lofts at the back of his house. Furthermore, he developed tongue angioedema and oropharyngeal pruritus after cashew, pistachio, and hazelnut ingestion, although he tolerated almonds and peanuts. He also complained of oral allergy syndrome after ingestion of unpeeled peach. The most recent reaction happened after ingestion of a coconut cake, when he experienced lip angioedema and facial pruritus. Interestingly, the patient had used body cream and shampoo containing coconut oil for the previous 4-5 years. He had a personal history of mild persistent rhinitis, but no history of atopic eczema.

Skin-prick tests (SPT) and prick-prick tests (PPT) were positive for all fishes tested, except for tuna and monkfish (fresh and cooked), with a specific IgE value (sIgE) (ImmunoCAP, Phadia) for parvalbumin (rGad c 1) of 0.64 kU/L (Table 1). Poultry meat (chicken, turkey, and duck meat) allergy was also confirmed with SPT and PPT, with sIgE for chicken meat of 4.28 kU/L. Curiously, he had positive PPT for fresh and cooked egg yolk/white. SPT and sIgE were positive for cashew, pistachio, and hazelnut. PPT was positive for peach skin (negative for pulp) with sIgE for peach 0.39kU/L and sIgE for rPru p 3 and rPru p 7 < 0.35 kU/L. Coconut sensitization was also confirmed with PPT and sIgE (3.5 kU/L). Immuno Solid-phase Allergen Chip (ISAC) results showed very high levels of serum specific IgE to rDer p 2 and rDer f 2, moderate/high levels to rDer p 1, rDer f 1, rDer p 10, nPen m 1, rAni s 3 and nBla g 7, and low levels to rGad c 1, rCor a 8 and Fel d 1, with negative values for nGal d 5 and rPru p 3 (Table 1). Sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) IgE immunoblotting assays were performed to better understand coconut sensitization and whether poultry meat allergy could have emerged in the context of fish-chicken syndrome.

Protein extracts from fresh coconut and coconut water were prepared by homogenization in phosphate buffered saline (20% W/V) (50 mM phosphate buffer, 100 mM NaCl, pH 7.5) with magnetic stirring, centrifugation to remove the non-soluble materials, dialysis of the supernatants against distilled water, and lyophilization.

SDS-PAGE IgE-immunoblotting revealed intense IgE binding bands at 24 kDa, 22 kDa, and 16.5/15.5 kDa in both coconut extracts, and a pair of bands at 55 kDa and 40 kDa were only detected in the fresh coconut extract (Figure 1). Comparing the molecular mass of these bands with those described for the coconut allergens,[7] we assume that the patient is probably sensitized to coconut 7S globulin (Coc n 1),

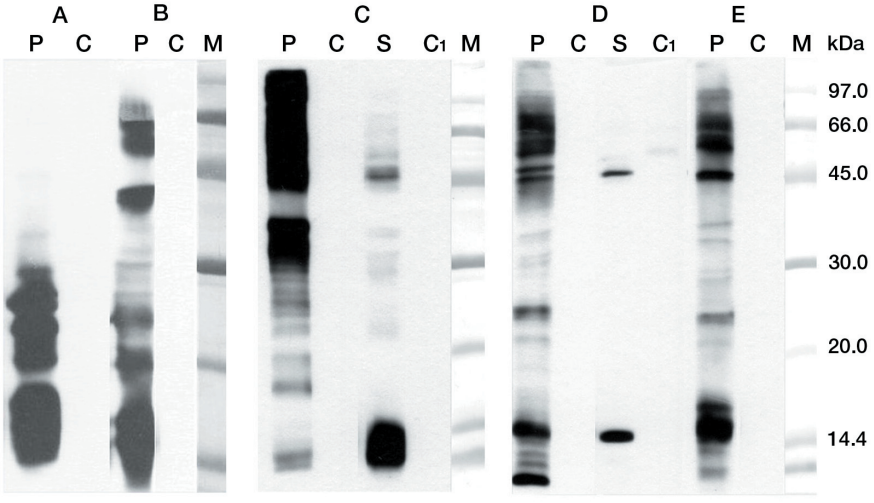

Figure 1
SDS-PAGE IgE-Immunoblotting. (A) Coconut water extract, (B) Fresh coconut extract, (C) Cod extract, (D) Chicken thigh extract, (E) Chicken breast extract. Lane P: Patient serum, Lane C: Control serum (pool of sera from non-atopic subjects), Lane S: Rabbit serum against sardine parvalbumin, Lane C1: Unimmunized rabbit serum, Lane M: Molecular mass standard.

Table 1
Skin-prick tests with aeroallergens, food extracts and food allergens, culprit food prick-prick tests, and specific IgE levels evaluated by ImmunoCAP and ISAC

	SPT [a] (mm)	PPT [a] (mm)	sIgE (kU/L)[b]	ISAC (ISU–E)
Aeroallergens				
D. pteronyssinus	13	–	54.2	rDer p 1: 11 rDer p 2: 26 rDer p 10: 11
D. farinae	10	–	39.8	nDer f 1: 1.3 nDer f 2: 19
Blomia tropicalis	4	–	–	–
Euroglyphus maynei	14	–	–	–
Lepidoglyphus destructor	6	–	3.45	–
Cat epithelium	5	–	3.22	rFel d 1: 0.3
Foods and food allergens				
Peach	–	Peel: 8 Pulp: 0	0.39	–
Nectarine	–	Peel: 8 Pulp: 0	–	–
rPru p 3	11	–	<0.35	
rPru p 4	–	–	<0.35	
rPru p 7	–	–	<0.35	
Almond	0	0	<0.35	–
Hazelnut	6	–	1.3	rCor a 8: 1.1
Pistachio	26	–	1.5	–
Cashew	19	–	0.69	–
Walnut	0	5	0.97	–
Peanut	0	5	<0.35	–
Coconut	–	8	3.5	–
Chicken meat	8	–	4.27	–
Turkey meat	10	–	0.71	–
Duck meat	–	Fresh: 12 Baked: 11	–	–
Egg yolk	0	Fresh: 5 Baked: 6	–	–
Egg white	0	Fresh: 10 Baked: 5	–	–
Ovomucoid	0	–	–	–
Ovalbumin	0	–	–	–
Parvalbumin	–	–	0.64	rGad c 1: 0.4
Codfish	12	–	–	–
Salmon	6	–	1.26	–
Sole	5	–	0.73	–
Sardine	7	–	0.65	–
Tuna[c]	0	Canned tuna: 4	–	–
Anisakis	–	–	0.61	rAni s 3: 3.7
Other tropomyosins:				nBla g 7: 7.8 nPen m 1: 6.4

[a] Mean papule diameter (mm). Histamine: 6mm.
[b] Total IgE: 563 kU/L.
[c] Other fishes tested: Hake (fresh: 6mm, baked: 11mm), Catfish (fresh: 22mm, baked: 16mm), Grouper (fresh: 10mm, baked: 10mm), Swordfish (fresh: 15mm, baked: 15mm), Plaice (fresh: 10mm, baked: 7mm), Horse mackerel (fresh: 7mm, baked: 22mm), Flat fish (fresh: 10mm, baked: 5mm), Corvina (fresh: 7mm, baked: 9mm), Gilt-head sea bream (fresh: 13mm, baked: 9mm), Baila (fresh: 5mm, baked: 7mm), Sea bass (fresh: 5mm, baked: 9mm), Trout (fresh: 14mm, baked: 15mm), Salmon trout (fresh: 18mm, baked 10mm), Beetle (fresh: 10mm, baked: 16mm).

ISAC = Immuno Solid-phase Allergen Chip; SPT = Skin-prick test; PPT = Prick-prick test; sIgE = Specific IgE antibody levels.

while the bands at approximately 55 kDa lead us to suppose that light sensitization to 11S globulin (Coc n 4) could be involved in this case.

Protein extracts from raw cod and chicken (thigh and breast) were prepared as mentioned above. SDS-PAGE immunoblotting revealed IgE reactivity at 60, 52, 45, 39, 31, 20, 18, and <14 kDa in cod extract and several IgE-bands between 85-45 kDa, and bands at 25, 16, and <14 kDa in chicken extracts (Figure 1). A rabbit serum against sardine parvalbumin detected bands with the same molecular weight to some of the bands detected in chicken (16 kDa) and cod extracts (< 14 kDa). This result suggests the patient could be sensitized to fish beta-parvalbumin and chicken alpha-parvalbumin. SDS-PAGE IgE immunoblotting-inhibition using raw chicken and cod extracts in the solid phase did not show any significant cross-reactivity between chicken and cod proteins (Figure 2).

Conclusion

Primary sensitization to poultry meat is even less common than bird-egg syndrome.[1,8] Alpha-parvalbumin and myosin light chain 1, enolase and aldolase are relevant allergens that have been implicated in primary poultry meat sensitization and also in cross-reactivity with fish.[1,2,9] Negative nGal d 5 values allow exclusion of bird-egg syndrome. The low specific IgE detected against fish parvalbumin and the IgE-reactive bands appearing at around 60 – 40 kDa in cod extract blots let us to suppose fish enolase or aldolase could be implicated in this case. Interestingly, our patient presented an asymptomatic co-sensitization to egg white/yolk. Hemmer et al. also found positive sIgE values (>0.35 kU/L) for egg yolk and/or white in 66% of poultry meat allergic patients, although these values were much lower than those for chicken meat.[1] However, the causal link remains unclear.

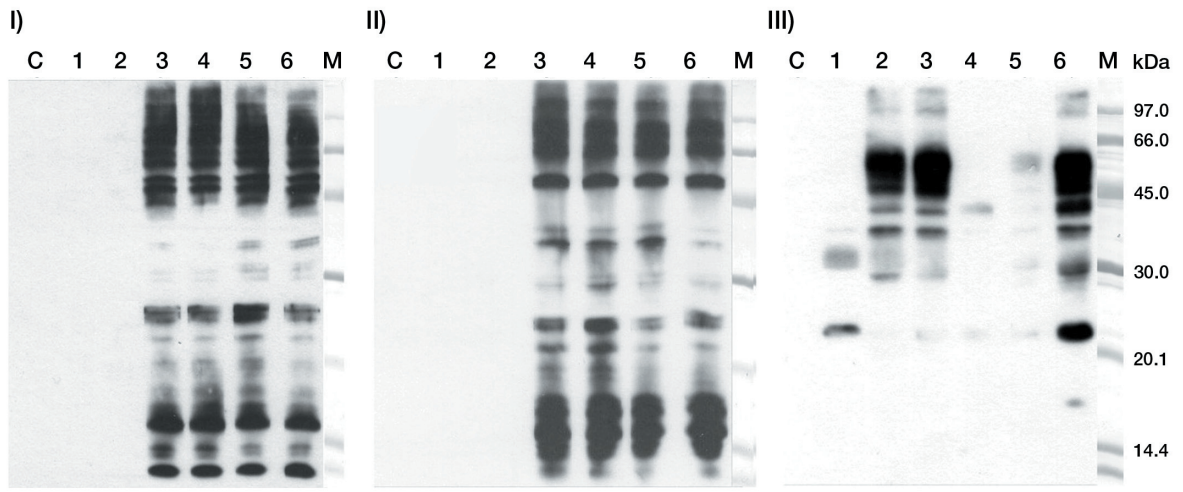

Figure 2
SDS-PAGE IgE-Immunoblotting-inhibition. I) Solid phase: Chicken thigh extract; II) Solid phase: Chicken breast extract. Lane C: Control serum (pool of sera from non-atopic subjects) Lanes 1 – 6: Patient serum pre-incubated with chicken thigh extract (lane 1), with chicken breast extract (lane 2), with hake extract (lane 3), with cod extract (lane 4), with salmon extract (lane 5), with sunflower pollen extract (lane 6), Lane M. Molecular mass standard. III) Solid phase: Salmon extract. Lane C: Control serum (pool of sera from non-atopic subjects) Lanes 1 – 6: Patient serum pre-incubated with cod extract (lane 1), with chicken thigh extract (lane 2), with chicken breast extract (lane 3), with hake extract (lane 4), with salmon extract (lane 5), with sunflower pollen extract (lane 6), Lane M. Molecular mass standard.

Coconut sensitization does not seem to be more likely in peanut or tree nut sensitized patients.[10] However, cross reactivity with walnuts and hazelnuts has been reported.[10] Our patient presents co-sensitization to coconut and peanut/tree nuts but different protein families seem to be involved.

We report an interesting case of multiple food allergy with primary sensitization to poultry meat, fish, and coconut. The patient currently tolerates several fishes (sole, plaice, corvina, golden, baila, tuna, and monkfish) and has been doing elimination of poultry meat, coconut, peanut, and tree nuts without any additional food reaction.

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