

Original Contributions

ANAPHYLAXIS PRESENTATIONS TO AN EMERGENCY DEPARTMENT IN HONG KONG: INCIDENCE AND PREDICTORS OF BIPHASIC REACTIONS

De Villiers Smit, MBChB, FACEM, Peter A. Cameron, MD, and Timothy H. Rainer, MD

Accident and Emergency Medicine Academic Unit, The Chinese University of Hong Kong, Shatin, New Territories, Hong Kong

Reprint Address: De Villiers Smit, MBChB, FACEM, 185 Copper Street, Epping, 3076, Victoria, Australia

Abstract—We describe the epidemiology, clinical features and management of anaphylaxis in a population in Hong Kong, including the features associated with progression to biphasic reactions and the nature of these reactions. A retrospective review was undertaken of patients of all age groups, presenting consecutively to the resuscitation room of a large Hong Kong emergency department with the diagnosis of anaphylaxis, from March 1999 to February 2003. There were 282 patients included. Median age was 28 years, with 59% male. A precipitant was identified in 89%, with 19% of patients claiming a known allergy to the precipitant. Seafood was responsible for 71% of all food-related reactions. More patients reacted to nonsteroidal anti-inflammatory drugs rather than antibiotics. Cutaneous features were present in 79%, and 12% presented with hypotension. Ninety-five percent received H1 antagonist, and 67% received epinephrine. Biphasic reactions were reported in 15 (5.3%) cases with 20% of these patients having unstable vital signs. The mean time from treatment to onset of biphasic reaction was 8 h (range 1–23). Patients with respiratory features on initial presentation were less likely to develop biphasic reactions. It is concluded that prolonged observation of patients with anaphylaxis is important, because of the risk of biphasic reactions. Better education could prevent recurrent anaphylaxis. © 2005 Elsevier Inc.

Keywords—anaphylaxis; anaphylactoid reactions; allergic reaction; allergy; biphasic reaction

INTRODUCTION

Anaphylaxis is a medical emergency that requires immediate treatment because of its potentially fatal outcome (1). Data regarding the epidemiology, incidence and prevalence of anaphylaxis are limited and are derived mostly from specialist immunology clinics (2–4). The clinical features, management, and outcome of patients presenting to an emergency department (ED) have been reported in a few studies, but not in an Asian population (5–8).

Although the initial clinical manifestations of anaphylaxis are well described, relatively few studies have reported the subsequent course of the reaction (9–13). Although the majority of reactions will be monophasic in nature, biphasic phenomena may occur.

The objectives of this study were to: 1) describe the epidemiology, clinical characteristics, and management of acute anaphylaxis in a population in Hong Kong; with a view to 2) determine the incidence and nature of biphasic reactions in patients with anaphylaxis; and 3) identify any features that may predict progression to a biphasic reaction.

METHODS

A retrospective chart review of all patients presenting to the resuscitation room of the emergency department (ED) of a university teaching hospital (Prince of Wales

Hospital, Shatin, Hong Kong) who presented with the diagnosis of acute anaphylaxis was performed between March 1999 and February 2003.

This large ED, a tertiary referral center for a population of 1,500,000, receives approximately 200,000 new patients (adult and pediatric) per year with an admission rate of about 20%. The department is staffed 24 h a day by emergency medicine advanced trainees and on-site specialist emergency physicians. The Residency Program in Hong Kong is 6 years, and includes regular updates on the management of anaphylaxis.

Definitions

Although there are no universally accepted clinical definitions for anaphylaxis or anaphylactic reactions, most clinicians will define anaphylaxis or an anaphylactic reaction as an IgE-mediated systemic immune response and an anaphylactoid reaction as a non-IgE-mediated systemic immune response (1). Due to the undifferentiated clinical presentation, we used the term “anaphylaxis” to describe both anaphylactic and anaphylactoid reactions, despite the theoretical distinction between the two.

A biphasic reaction is defined as any reaction occurring after initial treatment and complete resolution of symptoms (9).

Inclusion Criteria

The diagnosis entered into the resuscitation room logbook by an experienced resuscitation nurse was used to recruit individual cases. Patients with suspected anaphylaxis were to be triaged to the resuscitation room if the following were present: hypotension, severe cutaneous manifestation, respiratory or airway compromise, cardiovascular compromise such as hypotension or dysrhythmias, syncope or loss of consciousness, or any suspicion by the triage nurse of likely respiratory or circulatory compromise. Cases were included if the following diagnostic terms were used in the logbook: allergy, allergic reaction, anaphylactic reaction or shock, anaphylaxis, anaphylactoid reaction, bee stings or other insect bites, drug reactions, angioedema/angioneurotic edema, or urticaria.

Exclusion Criteria

Patients were to be excluded if the charts were unavailable for analysis, or anaphylaxis was not found to be the final diagnosis, as made by the discharging doctor.

Data Collection

The following information was recorded from standardized data collection instruments in place for general conditions: triage category [category 1 (critical) to be seen immediately, categories 2 (emergency), 3 (urgent), 4 (semi-urgent) and 5 (non-urgent) to be seen within 15, 30, 90, and 180 min, respectively] (14), age, sex, date and time of presentation, time (hours) from onset to presentation, time spent in ED and hospital as an inpatient, past history of asthma, allergies, allergic reactions or anaphylaxis, precipitant, clinical features, systolic and diastolic blood pressure on arrival, pulse and respiratory rate, oxygen saturations, temperature, peak expiratory flow rate (PEFR), prehospital treatment, ED management, and disposition from the ED. Prehospital treatment included patients self-medicating and those treated by family practitioners, seeing that the Ambulance Service in Hong Kong does not administer any medication. Symptoms mentioned anywhere in the history (including that of the triage nurse) were documented as being present. Signs were documented as present if stated by any doctor and assumed absent if the area was described as normal by the doctor. In addition, specific information regarding the occurrence of biphasic or multiphasic reactions in the ED, ED observation ward, or as an inpatient, was documented. This information included the time from presentation, the time from treatment, and the place of occurrence. Patients were admitted to the ED observation ward if it was the opinion of the specialist emergency physician that they were likely to be discharged within 12 to 24 h. No limit for the lag period from initial treatment to the biphasic reaction was established. Presentations to other hospitals within 5 days of discharge from our institution were recorded by using the Hong Kong identity (ID) number. This is a unique identifier for every person in Hong Kong, and would identify presentations to any hospital in Hong Kong.

Data were recorded on a standard abstraction form, and entered into an *Excel*[®] spreadsheet. A biphasic reaction was defined as any reaction occurring after initial treatment and resolution of symptoms, at any time during the patient's stay in either the ED, the ED observation ward, or as an inpatient, provided that there was no further exposure to the precipitant (if known).

Statistical Analysis

Continuous data were analyzed using Mann Whitney U test, whereas categorical data were analyzed using chi-square test. All data were analysed using Statview[®] for Windows version 5.0 Statistical Analysis Software (Abacus Concepts, SAS Institute, Cary NC).

RESULTS

Two hundred ninety-one cases were initially identified. Nine cases were excluded, leaving 282 patients with anaphylaxis requiring management in the resuscitation room to be included in the study during the 48 months between 1 March 1999 and 28 February 2003. The 9 excluded cases consisted of 5 cases where the charts were unavailable after multiple requests, and 4 cases where the final diagnosis was not an anaphylactic reaction (3 asthma patients and one patient with Steven Johnson's syndrome).

The patient demographics, clinical features, management and disposition are shown in Table 1.

Demographics

The median age was 28 years ([IQR 19–43]; range 1–91). One hundred sixty-seven (59%) were male, and 115 (41%) were female. Fifty-two percent of patients presenting between 4 p.m. and midnight, 26% between midnight and 8 a.m., and 22% presenting between 8 a.m. and 4 p.m.. The median time from onset of symptoms to presentation to the ED was 1.3 h ([IQR 0.79–3.0]; range 0–75). The median time spent in the ED was 0.73 h ([IQR 0.5–1.07]; range 0.17–6). The majority of patients were triaged as category 1 or 2 (1, $n = 17$, 6%; 2, $n = 164$, 58%). A previous history of asthma was given in 54 (19%) patients.

Clinical Features

Cutaneous features as a group were the most frequently reported symptoms, with urticaria accounting for 223 (79%), angioedema 171 (60.6%), and flushing or general pruritis 209 (74.1%). Nearly two-thirds of patients ($n = 185$; 65.6%) complained of dyspnea, but wheezing or bronchospasm were found to be a feature in only 85 (30.1%) patients. Thirty-eight (45%) of these patients with wheezing or bronchospasm had oxygen saturations of less than 96%. There were no reported symptoms of visual disturbances or seizures. In a majority of patients ($n = 265$; 94%), more than one organ system was involved. Thirty-three patients (11.7%) presented with hypotension (SD 9.8; range 57–88), which was defined as a systolic blood pressure of less than 90 mm Hg. This included one patient aged 10 years, with an initial blood pressure of 79/40 mm Hg. The rest of the patients in the pediatric age group were normotensive on presentation. In a quarter of patients ($n = 70$), the initial oxygen saturations were less than 96%, with 29 of these being below 93%. None of the patients in this study died.

Table 1. Presenting Characteristics and Patient Demographics of 282 Patients with Anaphylaxis*

General	
Age	28 [19–43]
Sex (Male)	167 (59.2)
Time from onset to presentation (hours)	1.3 [0.79–3.0]
Time in ED (hours)	0.73 [0.5–1.07]
Time in hospital (days) (observation and general ward)	0.56 [0.35–1.25]
History of asthma	54 (19.1)
History of allergy	116 (41.1)
Triage category	
1	17 (6)
2	164 (58.2)
3	74 (26.2)
4	27 (9.6)
5	0
Clinical features	
Urticaria	223 (79.1)
Angioedema	171 (60.6)
Flushing or general pruritis	209 (74.1)
Dyspnea	185 (65.6)
Wheeze/bronchospasm	85 (30.1)
Laryngeal edema	31 (11)
Tongue swelling	21 (7.5)
Chest pain: non-specific	16 (5.7)
Angina	1 (0.35)
Abdominal pain or diarrhea	27 (9.6)
Vomiting	23 (8.2)
Dysphagia	1 (0.35)
Headache	2 (0.71)
Syncope	16 (5.7)
Dizziness	39 (13.8)
Observations	
Systolic blood pressure (mm Hg)	129 [108.5–150]
Diastolic blood pressure (mm Hg)	68 [55.5–81]
Heart rate per minute	100 [81–114]
Respiratory rate per minute	24 [20–26]
Oxygen saturations (%)	97 [95–99]
Temperature (°C)	36.6 [36.1–37.1]
PEFR	300 [220–400]
ED management	
i.v. fluids	88 (31.2)
Epinephrine (i.v., i.m., s.c.)	188 (66.7)
H1 antagonists	269 (95.4)
H2 antagonists	4 (1.4)
Steroids	258 (91.5)
Salbutamol	95 (33.7)
Ipratropium	44 (15.6)
Intubation	4 (1.4)
Disposition	
Discharge ED	4 (1.4)
Discharge against advice	9 (3.2)
Observation ward	154 (54.6)
General ward	93 (33)
Intensive care unit	27 (7.8)

* The values are numbers (percentage) of patients or medians (IQR [25–75]).

Management

Seventeen (6%) patients received treatment with antihistamines before arrival in the ED, whereas only 6 received steroids, and 2 received epinephrine.

In the ED, 269 (95.4%) patients received H1 antago-

nist. The intravenous route was used most frequently ($n = 255$; 94.8%), with only 10 receiving oral preparations, and one receiving a subcutaneous dose. Chlorpheniramine maleate was the agent of choice in 266 (98.9%) cases. Epinephrine was given to 188 patients (66.7%), and was administered subcutaneously in 116, intramuscularly in 59, and intravenously in 16 cases.

Corticosteroids were given to 258 (91.5%) patients and by far the majority ($n = 253$; 98%) were administered intravenously (i.e., hydrocortisone). Intravenous fluids were only given in 88 (31.2%) patients. Crystalloids were the most commonly used type of fluid (83; 94.3%). Only 4 patients received H2 antagonists. Ninety-five (33.7%) patients received salbutamol. Four patients (1.4%) required endotracheal intubation and definitive airway management in the ED.

Disposition

Only 4 patients (1.4%) with anaphylaxis were discharged directly from the ED, whereas 9 patients (3.2%) discharged themselves against medical advice. A total of 115 (40.8%) were admitted to hospital, 93/115 (80.9%) to a general ward, and 22/115 (19.1%) to the Intensive Care Unit (ICU). The rest ($n = 154$; 54.6%) were admitted to the ED Observation Ward. The median time spent as an inpatient was 1.45 days (range 0.33–21.57) and in the ED Observation Ward was 10.6 h (range 1.4–99).

Precipitant

Two hundred fifty-two patients (89%) stated a clear precipitant they believed to be responsible for the reaction. Food as a precipitant was reported by 125 patients (49.6%), with seafood accounting for 89 (71.2%) of these. Drugs were the second largest group ($n = 102$; 40.5%), and included analgesia (non-steroidal anti-inflammatory drugs [NSAID] and aspirin) in 26 cases (25.5%), antibiotics in 24 cases (23.5%) and other drugs (including 22 reports of Chinese medicine) in 52 cases (51%). The rest were made up of bites and stings ($n = 18$; 7.1%), contact with plants and hair dye ($n = 4$; 1.6%), gas inhalation ($n = 1$; 0.4%) and 2 cases (0.8%) of idiopathic anaphylaxis. In 53 cases (18.8%), patients claimed a known pre-existing allergy to the precipitant. Twenty of these 53 cases (37.7%) were related to drugs other than Chinese medicine, with 11/20 (55%) prescribed by the General Practitioner, one by a Dentist, one by the hospital's outpatient department, two by the ED, and the rest either obtained "over the counter" or the source was unknown. Non-steroidal anti-inflammatory

drugs were involved in 8/20 (40%), and penicillin-based drugs in 7/20 (35%) of cases.

Biphasic Reactions

Fifteen patients (5.3%) experienced a secondary, or biphasic anaphylactic reaction, after documented complete resolution of the initial presenting clinical features.

The median age was 33 years (IQR [19–41.3]; range 6–80), with 3 of the patients (20%) being in the pediatric age group (younger than 15 years). Males outnumbered females 2:1. Seafood as a precipitant for the initial reaction was stated by 5 patients, drugs were responsible in 4 cases, and one case was due to an insect bite. In 3 patients no precipitant was documented, and in 2 patients the precipitant was unknown. Cutaneous manifestations were the most common initial complaint (urticaria in 14, angioedema in 8, erythema and pruritis in 13 patients). Respiratory features were much less common (dyspnea in 4 and wheeze in 3 patients). All of these patients had initial oxygen saturations of more than 96%. Two patients presented with tongue swelling and one with laryngeal edema. None of these required endotracheal intubation or airway management. One 39-year-old male with no previous medical history presented with generalized urticaria, chest pain and atrial fibrillation before receiving any treatment. This responded to antihistamines alone, but the rash and the atrial fibrillation occurred again after 13 h of observation.

The mean time from presentation to the ED, to the onset of biphasic reactions was 8.22 h (SD 5.46, range 1.4–23), and from receiving treatment to the onset of biphasic reactions was 7.57 h (SD 5.46, range 1.22–22.5).

Using the Hong Kong ID number, no patients were identified presenting to other hospitals within 5 days.

The observed frequencies of different variables in the uniphasic and biphasic groups are detailed in [Table 2](#).

DISCUSSION

This study describes the presentation, management and subsequent course of patients with anaphylaxis presenting to an ED in a predominantly ethnic Chinese community. In this population, non-steroidal anti-inflammatory drugs, along with seafood, were important precipitants, but surprisingly, Chinese medications were not. There were a significant number of biphasic reactions and this has important implications for further management and the period of observation. Respiratory features were less common and pronounced in those patients who went on to develop biphasic reactions.

Table 2. Features of 282 Patients with Anaphylaxis*

Characteristic	Uniphasic (n = 267)	Biphasic (n = 15)	p Value
General			
Age	28 [19–44]	33 [19–41.3]	0.925
Sex (male)	157 (58.8)	10 (66.7)	0.546
Time from onset to presentation (hours)	1.0 [0.7–3.0]	3 [2.0–6.3]	0.014
Time in ED (hours)	0.72 [0.5–1.0]	1.42 [0.74–2.2]	0.0026
Time in Hospital (days) (observation and general ward)	0.53 [0.34–1.09]	1.33 [0.67–2.58]	0.008
History of asthma	53 (67)	1 (33.3)	0.226
History of allergy	111 (47.2)	5 (38.5)	0.537
Precipitant (n = 252)			
Drugs	98 (86)	4 (57.1)	0.032
Food	120 (88.9)	5 (62.5)	0.288
Miscellaneous	24 (63.2)	1 (25)	0.172
Clinical Features			
Urticaria	209 (91.3)	14 (100)	0.248
Angioedema	163 (91.6)	8 (80)	0.215
Flushing or general pruritis	196 (92.5)	13 (100)	0.304
Dyspnea	181 (77)	4 (36)	0.0023
Wheeze/bronchospasm	82 (39.6)	3 (30)	0.543
Laryngeal edema	30 (61.2)	1 (33.3)	0.339
Tongue swelling	19 (59.4)	2 (66.7)	0.805
Chest pain: non-specific	14 (42)	2 (100)	0.113
Angina	1 (16.7)	0	—
Abdominal pain or diarrhea	25 (48)	2 (50)	0.941
Vomiting	22 (50)	1 (50)	0.000
Dysphagia	1 (25)	0	—
Headache	1 (33.3)	1 (50)	0.709
Syncope	16 (48.5)	0	—
Dizziness	37 (71.2)	2 (66.7)	0.868
Systolic blood pressure (mmHg)	129 [108–150]	127 [116.5–141]	0.723
Diastolic blood pressures (mmHg)	68 [55–81]	75 [61–79.8]	0.459
Heart rate per minute	100.5 [81–114]	97 [81–106]	0.445
Respiratory rate per minute	24 [20–26]	20 [20–22]	0.02
Oxygen saturations (%)	97 [95–99]	98 [96.3–99]	0.271
Temperature (°C)	36.6 [36.1–37.1]	37.1 [36.6–37.6]	0.012
PEFR	300 [220–400]	350 [222.5–432.5]	0.641
ED management			
i.v. fluids	85 (31.8)	3 (20)	0.336
Epinephrine	177 (66.3)	11 (73)	0.574
H1 antagonists	254 (95.1)	15 (100)	0.382
H2 antagonists	4 (1.5)	0	0.633
Steroids	245 (91.8)	13 (86.7)	0.492
Salbutamol	94 (35.2)	1 (6.7)	0.023
Ipratropium bromide	43 (16.1)	1 (6.7)	0.327
Intubation	4 (1.5)	0	0.633

* The values are numbers (percentage) of patients and percentiles (IQR [25–75]). Percentages are of valid responses.

Demographics

The median age of 28 years was lower, and the male predominance of 2:1 was in sharp contrast with that reported by other authors (2,5,8). The reason for this phenomenon is unclear. The fact that more than 75% of our cases presented between 4 p.m. and 8 a.m. has important implications regarding staffing of EDs in general. Traditionally, less senior staff are on duty “after hours,” and therefore the potential for complications may be higher. Appropriate education of junior staff regarding all aspects of anaphylaxis is very important.

Clinical Features and Management

The spectrum of anaphylactic responses ranges from localized to systemic. More severe systemic anaphylaxis can cause anaphylactic shock and death with a reported fatality rate of 1% (15). None of the patients in this study died. Cutaneous manifestations were by far the most common reported clinical features, with 79% of patients reporting urticaria. This is in keeping with previously published findings (2,10,15). In 31 patients, laryngeal edema as diagnosed by flexible laryngoscopy was a feature, and 4 of these required endotracheal intubation.

Table 3. Biphasic/multiphasic Reaction as Reported in the Medical Literature

Study	Incidence of biphasic reactions (%)	Number of biphasic reaction/ total number patients in study	Time (hours) from initial to biphasic reaction
Brazil et al. (10)	18	6/34	4.5–29.5
Douglas et al. (11)	6	6/103	1–72
Lee et al. (9)	6	6/105	5.6–47.6
Stark et al. (12)	20	5/25	1–8
Brady et al. (13)	3	2/67	24–48

Although food ingestion in general was responsible for more anaphylactic reactions than drugs, drugs were more likely than other agents to cause hypotension with nearly half (48%) of hypotensive episodes due to drug ingestion. Interestingly, none of the hypotensive drug reactions was attributable to NSAIDs, and only one of the hypotensive food reactions was due to a precipitant other than seafood.

Unlike the study by Cianferoni et al. (7), the drug group was less likely to receive epinephrine than the food group (64% vs. 72%, respectively). Overall, only 8.5% of patients were administered intravenous epinephrine, but this figure doubled (16%) in the hypotensive group, most likely because of the availability of intravenous access and the obvious need for it. The increased efficacy of H1 when combined with an H2 antagonist as second line treatment of anaphylaxis has been discussed extensively in the literature (16–20), yet we found that only 4 of our patients (1.4%) received H2 antagonist. None of the 4 patients had unstable vital signs or developed a biphasic reaction. This low usage of H2 antagonists is in sharp contrast to the 60.5% reported by Brown and McKinnon (5), who also reported a lower usage of H1 antagonist (72%). In our study, nearly all patients received these agents. This, as well as the fact that nearly all the patients received the same agent, is indicative of local practice. Education as to the potential advantages of combined therapy may be indicated.

Precipitant

Even with milder symptoms on initial presentation, the potential for rapid progression to a severe reaction and irreversible shock always must be kept in mind. It is therefore imperative not only to treat this condition immediately, but also to prevent anaphylactic reactions by identifying the causative agent where possible and to prevent further contact. An identifiable precipitant was stated in 89% of cases. Due to the retrospective nature of the study, more specific causes could not be identified (e.g., by skin testing). Cases where the precipitant was unknown, or not stated, were not labeled “idiopathic” because further tests were not performed. Idiopathic ana-

phylaxis is anaphylaxis of unknown etiology that is not triggered by any exogenous stimuli (21). This study also reports on Chinese medicine as a precipitant for anaphylaxis. Unfortunately, due to the huge variability in preparations, it would be extremely difficult to determine the exact substance involved. The incidence of seafood allergy (32%) is also higher, with figures previously reported between 7% and 26.5% (8,22). This is consistent with a high seafood intake in the local Cantonese population. Due to the high usage of monosodium glutamate (MSG) in the preparation of Chinese food, it may be very difficult to distinguish true seafood allergy from a reaction to MSG or any other food-additive. Some reactions possibly could be due to scromboid poisoning, the incidence of which is not known in Hong Kong.

Nearly one-fifth (18.8%) of the patients in our study reported a previous allergic reaction to the precipitant, which is lower than the 28.2% reported in an Australian study by Brown et al. (5). Forty-two percent of our cases were due to drug reactions, which were prescribed by medical practitioners in 75% of cases. Better patient education, drug and allergy history taking, and wearing of alert bracelets may avoid some of these potentially fatal and preventable iatrogenic reactions.

Biphasic Reactions

The incidence of biphasic reactions in patients with anaphylaxis presenting to the resuscitation room was 5.3%. This is the largest study to date reporting on biphasic reactions. The incidence reported in the medical literature ranges between 3% and 20% (see Table 3). The majority (12/15; 80%) of these reactions were mild, and had the same clinical features as the initial reaction. Hypotension was documented in 2 patients, and severe dyspnea with oxygen saturations of 92% in one patient at the time of occurrence of the biphasic phenomenon. These 3 patients had stable vital signs on initial presentation. All of the biphasic reactions occurred within 23 h of onset of symptoms. One patient experienced the biphasic reaction at home. This patient was seen initially in the ED, but not included in the study, because the initial symptoms were very mild (and therefore did not require

treatment in the resuscitation room). Treatment consisted of antihistamines alone and the patient was sent home. The recurrent rash was much more severe and the patient was managed in the resuscitation room, although the hemodynamics remained stable. Eight patients encountered a biphasic reaction more than 8 h after initial presentation, and 6 of these 8 h after initial treatment. If patients were to be observed for 6–8 h after administration of epinephrine and then discharged, as recommended by Brown et al. (16), we would have discharged 4 patients with biphasic reactions. This includes one patient with significant oxygen desaturation as a biphasic feature at 12 h. On the other hand, we would have been successful in capturing all the patients with biphasic reactions if we were to observe them for 24 h after administering epinephrine, as recommended by Brazil and MacNamara (10).

Brazil et al. (10) also did not find any distinguishing clinical features that enabled clinicians to predict whether a patient might develop a biphasic reaction. The only features that reached statistical significance in the biphasic reaction group in our study were: the time from onset of symptoms to presentation (biphasic patients took three times as long to present), the time spent in ED and in hospital, the presence of dyspnea (biphasic reactions were less likely to present with dyspnea), the administration of salbutamol (occurred much less in the biphasic group), respiratory rate (was lower in the biphasic group), and temperature (higher in the biphasic group). Patients who reported drugs as a precipitant were also less likely to develop a biphasic reaction. The fact that dyspnea, tachypnea, and the use of salbutamol occurred less frequently in the biphasic group is interesting, given that there were no statistical differences regarding wheezing between the two groups.

Limitations

The data reported in this study were collected retrospectively, and it is likely that some patients may not have been included and that some data items may be missing. There was also no specific documentation in the medical and nursing notes of protracted anaphylaxis. Due to the method of recruiting patients for the study, a true incidence of anaphylaxis could not be determined. No distinction was made between anaphylactic and anaphylactoid reactions and although it is of little relevance to the frontline medical staff encountering these conditions on presentation, it becomes more relevant when prevention and education is considered. The fact that patients may have reported they had ingested specific food, or taken various drugs, does not in and of itself indicate that the specific precipitant was responsible for the anaphylactic

reactions. A prospective study, verifying the above findings, is indicated.

CONCLUSION

Given that by far the majority of patients gave a history of a precipitant and one-fifth of patients had another reaction to the same precipitant, future episodes may be avoided with better patient education and discharge advice. Non-steroidal anti-inflammatory drugs caused more reactions than antibiotics as a group. More careful selection of analgesia, the wearing of alert bracelets, and better history taking may prevent iatrogenic reactions. Patients were less likely to develop biphasic reactions if respiratory signs and symptoms were present. Although the majority of patients can be safely discharged from the ED after a period of observation, biphasic reactions may occur late, and some of these may be severe in nature. A reasonable approach would be to observe those who received epinephrine and remain stable for 24 h, and to observe all other patients for 12 h.

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