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Caustic Esophageal Strictures in Children: Diagnosis, Treatment and Evolution in the City of Douala

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Abstract

Background: Pediatric caustic ingestion remains frequent and the formation of esophageal strictures is one it's most dangerous and major complications. The treatment is usually long and difficult and the success of treatment usually depends on the characteristics of the esophageal stricture. The main purpose of our study was to evaluate the diagnosis, treatment and the evolution of cases of caustic esophageal strictures in children in 3 hospitals of the city of Douala.

Methods: It was a retrospective and analytic study conducted at the general hospital of Douala, Laquintie hospital of Douala and the Douala gyneco-obstetric and pediatric hospital of Douala from January, 1st 2011 to December 31st 2020, from which we had 31 cases of esophageal strictures post ingestion of caustic substances.

Results: Cases of caustic esophageal strictures accounted for 23.7% of caustic ingestions and represented 88.6% of the cases of esophageal strictures in children. The mean age of patients was 3.8±2.1 year with extremes going from 1 to 11 years and 61.3% (n=19) of our patients were aged from 2 to 6 years. The male sex was the most predominant with a sex ratio of 1.6. The ingestion was accidental in all the cases, with caustic soda being the most ingested substance in 32.3% of the cases. Drooling was the most frequent initial sign in 45.2% of the cases and dysphagia developed in 93.5% of patients at the stricture phase. 61.3% of our patients had signs of malnutrition and feeding gastrostomy was done in 64.5% of patients. The upper third esophagus was the most frequent localization in 65.6% of the cases. 64.5% of patients were treated by endoscopic dilation and 9.7% required an esophageal replacement. The average duration of treatment was 11.53±4.6 months; it was significantly shorter for patient with short and passable strictures. Dysphagia, drooling, weight loss and ingestion of alkaline were significantly associated with the formation of esophageal strictures.

Conclusion: Cases of caustic substance ingestion remain common in our hospitals; endoscopic dilatation occupies the first place in the treatment of caustic esophageal strictures. Prevention still remains the key treatment in the formation of esophageal strictures.

Keywords: Caustic, Strictures, Esophagus, Endoscopic dilatation, gastrostomy, Douala

Introduction

Caustic substance ingestion (CSI) continues to be a soaring global health

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issue especially in developing countries [1]. Children are said to represent about 80% of the patients with caustic induced lesions and these ingestions are accidental most of the time for children [2, 3]. The most frequent and dangerous complication of these ingestions is the formation of a stricture. An esophageal stricture is therefore defined as an anastomotic restriction caused by luminal scarring and fibrosis that result in the clinical symptom of dysphagia [4, 5]. It is the "Achilles heels" of caustic ingestion for patients who survived the emergency period [6]. In the USA about 5000-15000 cases per year of caustic related injuries are reported, and about 40.000cases yearly in the United Kingdom [1]. In a study done in Mexico, the rate of esophageal strictures formation post ingestion was of 48.9% [7]. In Australia in 2009 Riffat and al found a stricture formation rate of 10% [8]. In Africa though cases of caustic ingestions still remain unreported; some studies about caustic esophageal strictures have been made like that of Agbara and Al of Ivory Coast who found a hospitalization frequency of 6.2 cases per year [1, 9]. In Mali it represented about 1.93% of the total hospitalizations in the surgery unit with 85% of cases being children [10]. The mean age in Morocco was 3.5years with sex ratio of 1.5[11]. 75% of stricture formation post ingestion where due to a delay in consultation said Ekpe and Al of Nigeria [12]. Clinically the major presenting symptom is dysphagia in most of the cases [13]. Alkaline substances are said to be more responsible in the formation of esophageal stricture in about 41.5% of patients compared to 30.7% by acids [14]. Strictures are said to develop within few weeks after CSI or even a year later, specifically within the first two months [15]. Endoscopy is considered by most as the cornerstone is the diagnosis of corrosive ingestion. Initial endoscopy is indicated in every case of CSI, usually done within 24-48hours after ingestion it is reliable in predicting future stricture formation [2,16,17]. Endoscopy therefore provides excellent information that is essential in the stricture diagnosis, treatment and follows up [15]. Contrast swallow study is also efficient to evaluate patient's dysphagia after caustic ingestion, and predict the length of stricture which is an important prognostic factor [18]. Stricture formation is considered as the most difficult complication of caustic ingestion to treat [4]. Endoscopic dilatation such as bougienage or balloon dilatation is considered as the basis of treatment for focal esophageal stricture, though it has a low success for corrosive induced strictures of about 29-70% compared to other benign strictures [19]. In cases of failure of dilatation esophageal replacement is the surgical resort. In developing countries the treatment has shown some limits mainly due to delay in consultation, the lack of resources. If treatment well assessed complication rate are usually low with 10% of cervical leakage, 5% of proximal strictures, with a low rate of mortality of about 1% [1,20]. But caustic ingestion with stricture formation is said to be associated with a high risk of developing esophageal carcinoma, its risk is 1000 times the expected occurrence rate in the general population [21]. In our country cases still remain unreported due to the unawareness of the population about the damages of caustic substance ingestion, which made us take an interest to subject to evaluate how and when the diagnosis of esophageal strictures post ingestion is made, how is it treated and the evolution of cases.

Materials and Methods

It was a retrospective and analytic study conducted at the general hospital of Douala, Laquintinie hospital of Douala and the Douala gyneco-obstetric and pediatric hospital of Douala from January, 1st 2011 to December 31st 2020. Were included in this study the medical reports of all children aged below 15 years, hospitalized and/or treated for esophageal strictures post ingestion of a caustic substance confirmed on endoscopic exam and/or contrast swallow study exam. Children with non-caustic benign esophageal strictures. In order to fill our data collection questionnaire we went in archives of the units of pediatrics, pediatric surgery, general surgery in order to consults the files of the hospitalized patients during our period study. Files were selected accordingly to the inclusion and exclusion criteria's. Variables collected were: Socio-demographic, clinical and paraclinical, treatment and evolution.

Results

During our study period we had identified a total of 31931 patients which had been hospitalized in the units of pediatric, pediatric surgery and general surgery of the 3 hospitals in which our research had taken place. The global prevalence of the cases of caustic esophageal stricture in children was of 0.1% (10 cases for 10 000). The rate of stricture formation was of 23.7%. Male patients made up to 61.3% (n=19) of patients with a sex ratio M/F of 1.6. The mean age in our series of cases was 3.8±2.1 years, with extremes of 1 and 11 years. The most represented age class was that of 2 to 6years with 54.8% (n=17). Caustic soda was the most ingested type of caustic in our series with 32.3% (n=10) of the cases, followed by liquid detergents and bleach with 19.4% (n=6) and 12.9% (n=4) respectively. Ingestion was accidental in all the cases (100%). Alkaline was the most ingested nature of caustic with 77.4% (n=24) of the cases. Dysphagia was the most frequent presenting symptom on admission representing 93.5% (n=29) of the cases. Drooling or salivation was the second most present symptom with 64.5% (n=20) of the cases. The average interval between the ingestion of the caustic substance and the presence of dysphagia was 51.3± 54.5 days with extremes going from 4 days to 252 days (8.4months). Dysphagia appeared post ingestion in less than 30 days in 51.6% (16) of the cases. Dysphagia to solids was the most frequent type of dysphagia present in 51.6% (n=16). We could not find a significant difference between the degree of dysphagia and the nature of the caustic substance ingested

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(p=0.498). The general state was altered in 58.1% (18) of the cases. The average weight in our series was 12.94±3.95 kg with a range going from 6 to 25 kg, and 35.5% (11) of patients had lost about 3-5kg of their original weight. Dehydration and malnutrition was severe in 41.7% (n=5) and 73.7% (n=14) of the patients respectively. The average rate of hemoglobin in our series of cases was 11.56±1.25 g/dl with a range of 9.7 g/dl to 14.6 g/dl. Most of our patients (n=12; 38.7%) had light to moderate anemia (value of hemoglobin between 7 to 12g/dl). Leukocytes count had a mean value of 11384±3575 cells/mm3, with extremes going from 4700 to 19300cells/mm3. Hyper leukocytosis was present in 41.9% (13) of our patients (with values higher than 10000cells/mm3. The mean c reactive protein value was 42.79±60.09 with a range going from 3 to 199.50 mg/l. an elevated CRP value (>6mg/l) was present in 25.8% (8) of cases. Grade 2b of Zagar's classification of mucosal injury was the most frequent with 16.1% (5) in our series for the cases who had performed an early endoscopy after ingestion. Endoscopy done at the stricture phase showed an impassable stricture by the endoscope in 73.9% (17) of the cases (Table 1).

The upper third esophagus was the most frequent localization of the esophageal stricture representing 65.5% of the cases (n=21). Strictures were mostly short in length and regular in aspect in 54.8% and 67.7% of the cases respectively. Strictures were mainly unique which accounted for 87.1% (n=27) of the cases. There was significant difference between the nature of the caustic ingested and the permeable or not character of the stricture on endoscopy. (p=0.392). Acid-like caustics gave more short strictures in 6 cases, while alkaline caustics gave more long strictures in 13 cases, but there was no significant difference between the nature of the caustic and the length of the esophageal strictures (p=0.073). Alkaline substances caused more upper third esophageal strictures in 18 cases, but we did find a significant link between the nature of the caustic and the localization of the stricture (p=0.305) (Table 2).In our series 2 (6.4) patients had a chest X-ray done and results showed a pleural effusion and sub-cutaneous emphysema in each case. The average interval between the ingestion and the first treatment of the patients on admission was 2.02± 2.5 months with extremes going from 1 hour to 11 months. Most of the cases received a first treatment after ingestion in an interval of less than one month in 51.6 %(16) of cases. A notion of initial management after ingestion was recorder in 15 patients (48.4%) and steroids administered in 6 cases (40%) of those who had received an initial treatment. The most frequent method of feeding was enteral feeding in 67.7% of cases. Oral feeding was only used in 6.5% of patients who did not have dysphagia. Pylorotomy was performed in one case of a patient who also had a caustic pyloric stenosis associate. All the patients in our series had required an enteral method of feeding. Feeding gastrostomy was the most frequent method of enteral and was performed in 64.5% (n=20) of the cases followed by the use of nasogastric tube which was used in 32.3% (n=10) of cases, and the Feeding jejunostomy (3,2%, n=1). At the stage of esophageal stricture 67.7% (n=21) received a treatment. Endoscopic dilatation was performed on 64.5% (n=20) of the patients and 1(3.2%) patient immediately required an esophageal replacement while 2 (6.5%) had the replacement after a failure of the attempted endoscopic dilatations. Toni Lerut candles were the most used type of dilators in our series with 35.5% (n=11) of the cases while Savary Gillard candles were used in 11 (29.0%) cases. In our series, patients had 1 to 3 sessions of endoscopic dilatation in 51.6% (n=16) cases. The average number of sessions was 2.6±1.53 with extremes going from 1 to 7 sessions. Pylorotomy was performed in one case of a patient who also had a caustic pyloric stenosis associate (Table 3)

Table 1: Distribution of cases following results of endoscopy

	Effective	Percentage (%)
Early Endoscopy		
Grade 0	1	10
Grade 2a	3	30
Grade 2b	5	50
Grade 3a	1	10
Total	10	100
Endoscopy at stricture phase		
Impassable	17	73.9
Passable	6	26.1
Total	23	100

Table 2: Distribution of patients according to the characteristics of the strictures after barium meal contrast swallow study exam.

	Effective	Percentages
Localization of stricture		
Upper third esophagus	21	65.6
Middle third esophagus	7	22.6
Lower third esophagus	2	6.3
Upper and lower third esophagus	1	3.2
Length of stricture		
Long	14	45.2
Short	17	54.8
Aspect of stricture		
Regular	21	67.7
Irregular	10	32.3
Number of strictures		
Unique	27	87.1
Double	2	6.5
Multiple	2	6.5
Associated		
Pyloric stenosis	1	3.2
None	30	96.8

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Table 3: Distribution of cases according to the treatment received for the stricture

	Effective	Percentage
Treatment at stricture stage	21	67.7
Endoscopic dilatation	20	64.5
Type of dilator		
Toni Ierut	11	35.5
Savary Gillard	9	29
Number of sessions		
1-3	16	51.6
4-7	4	12.9
Esophageal replacement	3	9.6
Colonic interposition	2	6.5
Gastric tube	1	3.2
Indication of replacement		
Failure of endoscopic dilatation	2	6.4
Esophageal necrosis	1	3.2

Endoscopic revaluation of the strictures at the end of dilatation session showed passable strictures in 45% (9) of the cases. Perforation after a session of endoscopic dilatation was present in 1 (3.2%) case which led to emphysema and mediastinitis treated by antibiotics. After surgery, 2 (6.5%) cases developed complications. Post-operative bowel obstruction which was treated surgically by an explorative laparotomy. Proximal esophageal stricture on bride which required 3 sessions of endoscopic dilatation. A total of 32.3% (n=10) of the cases had resumed normal oral feeding without any sequelae. We had 3 (9.7%) cases of death and we had lost sight of 32.3% (n=10) of our patients at the end of our study. The average treatment duration in our series was 11.56±4.6 months. With extremes going from 2.3 to 45 months. Concerning possible risk factors of the formation of caustic esophageal strictures in our series of cases, we found that, dysphagia and drooling were significantly associated in the formation of an esophageal stricture (p=0.000 and 0.022 respectively); therefore, the presence dysphagia and drooling multiplied by 195 times and 3.4 times the risk of developing an esophageal stricture. The nature of the caustic was significantly associated with the formation of an esophageal stricture (p=0.041). The ingestion of alkaline substances multiplied by 3 times the risk of formation of an esophageal stricture for a CI at 95% of [1.051-9.742]. A high C - reactive protein value was significantly associated with the formation of an esophageal stricture in 66.7% (8) of the cases (p=0.045). It multiplied by 12 the risk of formation of a stricture for a CI at 95% of [1.053-136.794]. In our series of cases 58.1% (18) of patients who developed an esophageal stricture did not receive proton pomp inhibitors while 58.6% (17) of patients without strictures did not receive PPI and this difference was not statistically significant (P=0.965).

Discussion

Cases of caustic ingestion still remain unreported mainly in LMIC, therefore underestimating the number of cases [1]. The hospital prevalence of CES in our series was 0.1%, this hospital prevalence is close to that found by Oumar in 2009 in Mali with 0.2% and different from that found by Hamza in 2003 in Egypt with 30.6% [20,22]. This difference in hospital prevalence can be explained by the fact that cases of esophageal stricture are treated in other hospitals and also the difficulty to find the patients' medical reports in hospitals. In our series we had 31 cases in 10 years making it 3.1 cases per year. This frequency was similar to that of that of Ekpe and al in Nigeria in 2012, Lan-lan Geng and al in China in 2018 with 4 and 4.8 cases per years respectively [20,23]. It was different from that found by Hamza and al in Egypt in 2003, Mboup Madawase and al in 2019 in Senegal and Agbara and al in 2019 in Ivory coast with 15.8, 15.6, and 5.5 cases/ years [9,20,24]. This difference can be explained by the fact that cases were treated in hospitals other than those being used for our research. The stricture formation rate in our series was of 23.7% which was similar to that of Le Naoures and al in 2017 in France with 22% and De Jong and al in 2000 in Canada with 20% [15,25]. It was lower than that found by Sanchez-Ramirez and al in 2011 in Mexico with 48.9% and higher that found by Riffat and al in Australia in 2009 and Roida and al in Morocco in 2010 with 10% and 12.5% [7,8,26]. This difference could be explained by that nature, quantity of caustic ingested and the extent of injuries to the esophagus initially which could all play a role in the formation of esophageal strictures. The mean age was 3.8±2.1 years with extremes going from 1 to 11years which was similar to the results of Tadmori and al in 2015 in Morocco, Uygun and al in 2013 in Turkey, and Hamza and al in 2003 in Egypt with 3.4 years, 3.5 year, 3.5±2.1 and 3.2 years respectively [20,24,27]. It was higher than that found by Mboup Madawase and al in Senegal in 2019 with 2.7y years and lower than that found by Seydou and al in 2016 in Mali with 6±4 years [24,28]. In our study, there was a male predominance for a sex ratio M/F of 1.6 which similar to that found by Tadmori and al in 2015 in Morocco, Ekpe and al in 2012 in Nigeria and Uygun and al in 2013 in Turkey, Lan-lan Geng and al in 2018 in China with a male predominance for a sex ratio M/F of 1.5, 4.3, 1.5 and 1.9 respectively [12,23,25]. This male predominance can be explained by the fact that boys are usually considered to be more hyperactive than girls and tend to explore more their environment. Alkaline were the most ingested in 77% of cases compared to acids in 25% of cases, these alkaline are mostly sodium hydroxide, potassium hydroxide which is usually found in the composition of household products like liquid soap, bleach, oven cleaning products etc. These results were similar to those found by Uygun and al in 2013 in Turkey, Ekpe and al in 2012, Dejong in 2001 in Canada, Agbara and al in 2019 in Ivory Coast in

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which alkali were the most ingested caustics in 81%, 93.7%, 70% and 76% of cases respectively; but it was different from the results found by Roida and al in 2010 in Morocco were acids were ingested in 45.3% of cases [9,12,25-27]. All the cases were accidental in our series as reported by Mboup madawase and al in 2019 in Senegal [24]. Dehgani and al 2018 in iran reported the ingestions being accidental in 95.1% of cases and Di Nardo and al in 2020 in Italy reported 84.1% of ingestions being accidental [24,29]. Cases of pediatric caustic ingestion are mainly accidental most of the time compared to adults; due to the fact that these children may be left unattended to or due to the negligence of their parents who do not keep these dangerous substances in a safe space. The main presenting was dysphagia in 93.5% of the cases. In our series 51.6% (16) of the cases had an apparition of dysphagia in the 30 first days following the ingestion of the caustic with average interval between the ingestion and dysphagia of 51.3±54.5 days with extremes going from 4 days to 252 days (8.4months). These results a closer to those found by Mboup Madawase and al in 2019 in Senegal with 62.4 days with extremes going from 10 to 364 days [34]. It was different from those found by Saye J in 2017 in Mali where dysphagia after ingestion appeared 4 to 5 months after ingestion in 68.3% (41) of cases, with an average of 2.25 months (67.5 days) with extremes going from 1 to 9 months [10]. This difference can be justified by the fact that, the apparition of dysphagia can be conditioned by the process of luminal scarring, the longer the apparition of fibrosis, the longer is the period of apparition of dysphagia. Tadmori and al in 2015 in Morocco, Agbara and al in 2019 in Ivory coast and Contini and al in 2009 in sierria leone [4] with dysphagia present in 100%, 94% and 100% of cases respectively [4,9,24]. In our series the dysphagia was mainly to solids in 51.6% of cases comparable to that found by Agbara and al were dysphagia to solids was more frequent in 80%; but in the studies done by Nissrine in 2012 in Morocco were dysphagia was total in 60% of cases [11]. The degree of the dysphagia evolves as the formation of the fibrosis continues therefore this difference can be explained by the stage of luminal scarring at which the patient is seen which determines the type of dysphagia. Weight loss was experienced in 87.1% of patients with signs of malnutrition present in 61.3% of cases, these results are similar to those found by Nissrine in 2012 in Morroco in which weight loss was found in 80% of cases whereas malnutrition signs were present in 20% of cases, Oumar Bore in 2010 in Mali were malnutrition was present in 80% of patients, Agbara and al in 2019 in Ivory Coast were malnutrition signs were present in 44% of cases [9,11,22]. The installation of malnutrition is explained by the presence of different degrees of dysphagia which considerably the amount of food intake. Hyper leukocytosis was present in 41.9% of the cases with an average leukocyte count of 11384± 3575 cells/mm^3 with extremes going from 4700 to 19300 cells/mm^3, which was different to what found by Chen and al in 2003 in China with an average leukocyte count of 15136.4±2089.6 which can be explained by the degree of esophageal injury, since leukocytes are usually useful parameters in monitoring inflammation [30]. An elevated CRP value (>6mg/l) was observed in 66.7% (8) of the cases with an average value of 42.79mg/l for extremes going from 3 to 199.02 mg/l, this results where similar to those found by Chen and al in 2003 with an average CRP value of 38.6±23.7mg/l. Initial endoscopy after ingestion was performed in 32.3% of patients done within the first 48hours of ingestion and grade 2b injury of Zagar's classification was the most frequent type with 50% of the patient who had done an endoscopy at the acute phase. These results were close to those found by Kumar and al in 2019 in India where all patients had done an endoscopy at the acute phase but grade 2b injury was the most frequent type in 43.9%, also Sanchez-Ramirez in 2011 in Mexico were grade 2b injury represented 84.6% of cases [7,31]. The different encountered in the number of patients who had an endoscopy early on can be explained by the lack of resources from patients or the non-prescription of an endoscopy by the consulting doctor and also the delay in consultation. At the stricture phase endoscopy was performed in 23 patients and the stricture was impassable in 54.8% of the cases, this result is similar to that found by Nissrine in 2012 in Morocco with impassable strictures in 60% of the cases; but different to that of Agbara and al in 2019 in Ivory coast with strictures being passable in 46.87% of cases [9,11]. The different can be explained by the type of caustic ingested which causes different type of injuries. Contrast swallow exam was performed in all patients. The most frequent localization of the strictures in our series was the upper third esophagus in 65.5% of cases followed by middle third esophagus in 25% of cases; this result is similar to that found by Contini in 2007 in Sierra Leone with upper third esophageal strictures in 75% of cases; but was different from what Uygun and al in 2013 in Turkey, Saye in 2017 in Mali and Lan-lan Geng in 2018 in china with localization being the middle third esophagus in 62%, 43.3% and 72.1% of cases respectively [10,23,26,27]. The nature (alkaline or acids) can explain the localization because strong bases like sodium hydroxide which was the most ingested substance in our series usually causes strictures in the upper esophagus [32]. In our series the strictures were unique in 87.1% of the cases, short in 54.8% and regular in 67.7%of the cases which was similar to those found Kumar and al in 2019 in India with unique strictures in 71.4% of cases, Agbara and al in 2019 in Ivory Coast unique stricture in 78% and short strictures in 42% of the cases [9,31]. The aspect of the esophageal stricture usually depends on the degree of initial mucosal injury classified by Zagar and how the scarring was formed; grade 3 injury usually tend to evolve in long strictures, whereas in our study patients tended to have grade 2a to grade 2b injuries [33,34]. Alkaline substances in our series caused more impassable and long strictures than acids in 60.9% and 41.9%

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but the difference was not statistically significant (non-significant p=0.423, 0.062) of cases which is different from that found by Saye in 2017 in Mali with alkaline causing significantly more impassable stricture than acids in 90.3% of cases (significant difference p=0.001) [10]. An alkaline substance causes a liquefactive necrosis, allowing deeper penetration resulting in more deep and circumferential injuries , in our series we could point out an evident link between the nature and the permeable or not feature of the stricture which could be explained by the quantity ingested , which most likely plays a role in the extends of injury [35]. Two patients had chest X-ray done with one normal and the other showed a pleural effusion similar to that found by Saye J in 2017 in Mali, where a chest X-ray showed a pleural effusion in one case, lung infection in 6 cases (10.0%) [10]. In our study, a notion of initial treatment was recorded in 48.4% (n=15) of our patients. All patients were giving intravenous liquids (ringer lactate or glucose 5%). Feeding gastrostomy was the most common methods of feeding used in 64.5% of cases especially for patients who already had malnutrition signs. These results are similar to that found by Saye in 2017 in Mali and Contini and al in 2007 in Sierra Leone with 63.5% and 58% cases respectively [10,32]. The need for feeding gastrostomy is essential when there is already installation of malnutrition; malnutrition which can be a threat in the treatment. A total of 67.7% of cases received treatment with 64.5% being endoscopic dilatation and esophageal replacement on 9.7% of cases with the indication to replacement being failure of dilatation, long and tortuous strictures. The average sessions of dilatation was 2.6±1.5, with extremes going from 1 to 7 sessions. This result was similar to that of Mboup Madawase in 2019 in Senegal with 2.5 average sessions with extremes going from 1 to 9 sessions and that Agbara and al in 2019 in Ivory Coast with an average of 2.72 sessions [9,24]. It was different from the results found by Lan-lan Geng in 2018 in China with average of 3.9 sessions [24]. This difference can be explained by the aspect of the strictures, short and regular strictures tend to be easier to dilate. Perforation was observed in one case (3.2%) after endoscopic dilatation, while post-operative bowel obstruction and proximal strictures were observed both in one case (3.2%) respectively after esophageal replacement which is similar to those found by Hamza in 2003 in Egypt in which post-operative obstruction was present in 2% of the cases [20]. At the end of our series 38.7% of our patients had regained normal oral feeding, we had lost sight of 29.0% of our cases and death occurred in 9.7% of our cases. These results were different to that found by Saye in 2017 in Mali with 50% of cases in complete remission and 16.7% of cases death [10]. This can be explained by the fact that more than half of the patients were seen at the stricture phase thus delaying the treatment and thereby reducing the rate of success of treatment. The average duration treatment (from the imaging diagnosis to the end of treatment) for those who had recovered completely was 11.563±4.616 months with extremes going from 2.3 to 45.5 months. It was similar to that found by Nissrine in 2012 in Morocco with average duration of 16,1 months with extremes going from 5 to 38 months and different from that found by Huet and al of 6.8 months and Sohan and al of 35.9 months [11,36,37]. We found that, the age class of 0 to 4 years was significantly associated with the development of esophageal strictures (p=0.038) but this result is different from that by Chen and al 2003 in China, Mahawongkajit and al in 2018 in Thailand and Le Naoures in 2017 in France who did not find an association between the age and the development of an esophageal stricture [8,15,38]. This results can be justify by the fact in our study the age o to 4 years was the most represented, and also younger age group tend to ingest more products in terms quantity thus increasing the consequences and chances of developing strictures later. Also in our series dysphagia (p=<0.001), drooling (p=0.022), weight loss (p=<0.001) and malnutrition (p<0.001) were significantly associated with the presence of esophageal strictures which was similar to the results found by Chen and al in 2003 and Le Naoures and al in which the presence of drooling or dysphagia was associated with strictures [15,30]. A high Serum Crp value in our series was significantly associated with the formation of esophageal strictures (p=0.045) which was different from the results found by Chen and al in 2003 in China in which the serum CRP value are more useful in evaluating the severity of injury and was found to be proportional to the degree of damage, but there was no significant difference in the CRP values of the groups with and without esophageal stricture (p=0.276) [27,30]. Serum CRP is a useful parameter for monitoring inflammation and after the onset of an acute tissue injury the value usually within 4 to 6 hours and usually peaks at 24 to 48 hours, in our series where a high serum CRP was associated with stricture formation it can be the degree of tissue injury and inflammation [30]. The ingestion of alkaline substances in our study was 3 times more significantly associated with the formation of esophageal strictures compared to acids (p=0.045) as found by Le Naoures and al, Mahawongkajit et al [15,38]. Alkaline tend to cause liquefactive necrosis and deep penetration, also alkali usually have an innocuous taste which allows ingestion of larger substances thus making the potential injury worse [8,39].

Conclusion

Even though cases of caustic esophageal strictures are not very frequent, it remains a dangerous complication of caustic substances ingestions and can lead to death. In our study boys were more affected than girls. Alkaline substances were the most ingested. Dysphagia was the most frequent symptom present on admission. The majority of our patient had lost weight and signs of malnutrition for which a feeding gastrostomy was required on more than half of the cases.

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Either endoscopy of a barium contrast swallow study exam was performed in all cases to confirm the diagnosis. More than half of the patients were treated by endoscopic dilation and 3 patients had to undergo esophageal replacement. Complications were noted in 3 cases and at the end of our study less than half of our patients had successfully regained normal oral feeding. The average duration of treatment was 11.5 months which was influenced by the permeability and the length of the stricture. The factors associated with the formation of an esophageal stricture in our study was ingestion of alkaline substances, dysphagia, drooling or excess salivation, weight loss, malnutrition and a delay in initial consultation after ingestion.

Limits of the study

The main limits and difficulties encountered in our study was the fact that medical reports of patients were difficult to find, or either had a lot of missing information that was capital in our study thus reducing considerably the size of our sample, and with the size of our sample being reduced, it could compromise the power of our results.

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