

LETTERS TO THE EDITOR

Ciguatera fish poisoning: also in Europe

Ciguatera fish poisoning is the commonest form of ichthyosarcotoxism, which results from the ingestion of a wide variety of reef fish.^{1,2} It is endemic in the tropics and subtropics, where its annual incidence varies from 100 to 300/100 000,³ and isolated outbreaks have been reported in temperate countries including the United States and Canada.^{2,4} The current trend towards more adventurous eating and increased seafood consumption might favour importation of fish capable of causing ciguatera in western countries. The disease is usually self limiting, but 0.1% to 1% of patients die as a result of heart failure or cerebral oedema.^{1,2} As simple treatment reduces the intensity and duration of symptoms, we describe two recent cases of ciguatera diagnosed in Paris, and recommend that all neurologists be aware of the diagnostic features of this disease, even in Europe.

On her way back to France from a vacation in the West Indies, a 31 year old woman developed nausea and diarrhoea eight hours after eating coral trout. Within 12 hours she developed numbness in the extremities, generalised myalgia, and weakness. Thinking she was tired because of the journey, she took a cold shower and experienced an intense burning sensation and tingling discomfort. The same symptoms occurred when she handled cold objects. By contrast, no unpleasant sensation or discomfort was felt when she washed with hot water or handled hot objects. Body temperature was normal. The paraesthesia specifically triggered by cold contact persisted 48 hours after onset. Neurological examination was normal. Laboratory studies and ECG were normal. Vitamin B6 was prescribed and the symptoms disappeared in less than a week.

A 45 year old West Indian man who had been living in Paris for more than 10 years received a reef fish purchased from a local street-side vendor and sent in an isotherm bag by rapid air delivery. The fish was still frozen on arrival (less than 12 hours after mailing) and "looked OK". It was cooked in the usual way on the same day. All family members became ill within two hours of the meal, with nausea and abdominal cramp. The wife, daughter, and stepmother had mild symptoms that rapidly subsided. The patient, who had consumed a large portion, developed watery diarrhoea and complained of distal paraesthesia and leg weakness. He also experienced "electric shock" and a burning sensation when he touched cold objects. His temperature was 37°C. Paraesthesia triggered by cold contact lasted more than a day. Physical examination, ECG, and laboratory studies were normal. The burning sensation disappeared two weeks later without treatment.

Ciguatera was diagnosed in both cases on the basis of ingestion of tropical fish from endemic regions, the presence of characteristic neurological features, and spontaneous recovery.

Ciguatera is characterised by the onset of gastrointestinal symptoms including nausea (43.5%), abdominal pain (42.5%), and vomiting (38.8%), that usually occur within 12 hours of eating ciguatoxic fish and that last no more than one or two days.² Within 12 to 24 hours of onset, the gastroenterological syndrome is followed by bothersome paraesthesiae, which are the most common presenting symptoms of ciguatera.⁴ These paraesthesiae are described as either numbness or tingling sensations in the distal extremities (89%) or perioral region (88.1%).² Paradoxical dysaesthesia (reversal of temperature perception), which manifests as painful tingling or burning sensations specifically triggered by cold stimuli, are considered almost pathognomonic for ciguatera toxin poisoning.^{3,5} Indeed, they occur in more than 87% of cases, and Europeans seem to be more susceptible to them than other ethnic groups.² Hot stimuli do not generally generate this kind of paradoxical dysaesthesia. There may also be vertigo, ataxia, progressive muscular weakness, paralysis of the limbs and facial muscles, ophthalmoplegia, delirium and, rarely, coma.^{1,2,6} Pupil size, deep tendon reflexes, and body temperature are usually normal, but patellar and Achilles reflexes may be diminished.¹ Death occurs in 0.1 to 1% of cases, reflecting individual susceptibility to toxins, increased sensitivity due to prior exposure, and consumption of viscera or larger fish with higher concentrations of toxin.^{1,6} Neurological symptoms usually last about a week but may persist for months and even years. Recently, two cases of polymyositis developed some years after the onset of ciguatera.⁷ Victims of ciguatera tend to experience sensitisation, and symptoms can recur after the ingestion of canned fish or alcohol.¹

The clinical manifestations of ciguatera have been attributed to tiny quantities of an odourless, tasteless, heat, and acid stable toxin, which is unaffected by normal storage conditions and cooking. Ciguatoxin is produced by the photosynthetic benthic dinoflagellate *Gambierdiscus toxicus* found on macroalgae in the coral reef environment.^{1,2} Other dinoflagellates may also play a part in the aetiology of ciguatera, but *G. toxicus* is by far the most toxic. Other toxins implicated in ciguatera include scaritoxin, maitotoxin, and palytoxin.² The toxins are accumulated through the food chain. Herbivorous fish eat *G. toxicus* in algae, and the toxin concentrates in their viscera and flesh. These fish are then consumed by larger carnivorous fish, which further concentrate the toxins. Humans ingest the toxins by eating the flesh or viscera of carnivorous fish.² Ciguateric fish cannot be identified by simple inspection, and no simple, reliable test is available for screening purposes.¹

The paradoxical dysaesthesiae are likely to be generated in cutaneous C polymodal nociceptor fibres. The intensity of the sensations depends on the discharge rate in these fibres.⁵ At the molecular level, ciguatoxin has been shown to cause a prolonged and abnormal influx of Na⁺ through excitable membranes by modifying voltage dependent sodium channels at receptor site 5.⁸

Mannitol infusion has reversed the acute neurological manifestations of severe ciguatera fish poisoning.⁹ The mechanism of action of mannitol is unknown, but possibil-

ities include competitive inhibition of Na⁺ at the cellular membrane, diuretic effect eliminating the toxin, and direct chemical detoxification.^{1,2} Lidocaine may also have a therapeutic effect by blocking the Na⁺ channels altered by ciguatoxin.³ It is also recommended that fish and alcohol consumption are avoided to prevent a worsening or prolongation of neurological manifestations.^{1,2} Clinicians familiar with ciguatera advise against the use of steroids, opiates, and barbiturates during the acute phase of the disease.²

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Botulinum toxin in the management of paradoxical activity of jaw muscles

Paradoxical activity of jaw muscles is a rare jaw movement disorder that occurs after lesions of the trigeminal motor nucleus or the trigeminal nerve.^{1,2} The disorder includes a progressive jaw opening disability due to unilateral coactivation of antagonistic jaw muscles. No adequate treatment has been reported.

A 62 year old man with longstanding hypertension was admitted to our intensive care unit with acute dysarthria, diplopia, right sided cerebellar ataxia, and severe left sided hemiparesis. Cranial CT showed an ischaemic brain stem infarction of the right pons and lower cerebellar hemisphere. Transcranial Doppler sonography documented occlusion of the basilar artery. Four months later he became progressively unable to open his mouth. He became unable to eat, speak, or brush his teeth and was confined to tube feeding.

Simultaneous EMG recordings were obtained from the temporal, masseter (jaw closers), and digastric muscles (mouth openers) on both sides. All of these jaw muscles were synchronously activated on

the right side when the patient intended to open his mouth but on closing his mouth, no activation of the masseter and temporal muscles could be detected (figure). On the left side, the innervation pattern was normal. Routine needle EMG analysis of the right temporal, masseter, and anterior digastric muscles showed a chronic neurogenic pattern.

With the EMG needle in place we injected 75 u botulinum toxin (BOTOX[®], Allergan) into the right masseter and temporal muscles. Three weeks after the injection the patient became progressively able to open his mouth, to eat, and to perform mouth care.

The pathogenesis of paradoxical activity of jaw muscles remains uncertain. For this patient we suggest that after a nuclear or axonal trigeminal lesion aberrant regeneration of trigeminal nerve fibres originally supplying jaw opening muscles led to false reinnervation of jaw closers. Thus, while intending to open the mouth, jaw closing muscles were falsely coactivated and prevented sufficient jaw opening. This innervation pattern was confirmed by EMG

polygraphy. The interval of four months between infarction and the beginning of paradoxical activity of jaw muscles may reflect the time required for the perinuclear and intranuclear regeneration process.

Paradoxical activity of jaw muscles has to be differentiated from other clinically similar disorders. These include hemimasticatory spasm,³ focal dystonia of jaw closing muscles,⁴ local tetanus,⁵ and diseases of the temporomandibular joint. Hemimasticatory spasm produces involuntary jaw closure due to unilateral contraction of jaw closing muscles, whereas paradoxical activity of jaw muscles occurs only during intended jaw opening. Jaw closure dystonia, which may occur unilaterally, is often linked to specific tasks or actions, may be accompanied by other dystonic movements, and lacks neurogenic change on needle EMG. Local tetanus can be identified by the absence of a silent period and its permanent muscle activity. Disorders of the temporomandibular joint would be obvious on radiological examination.

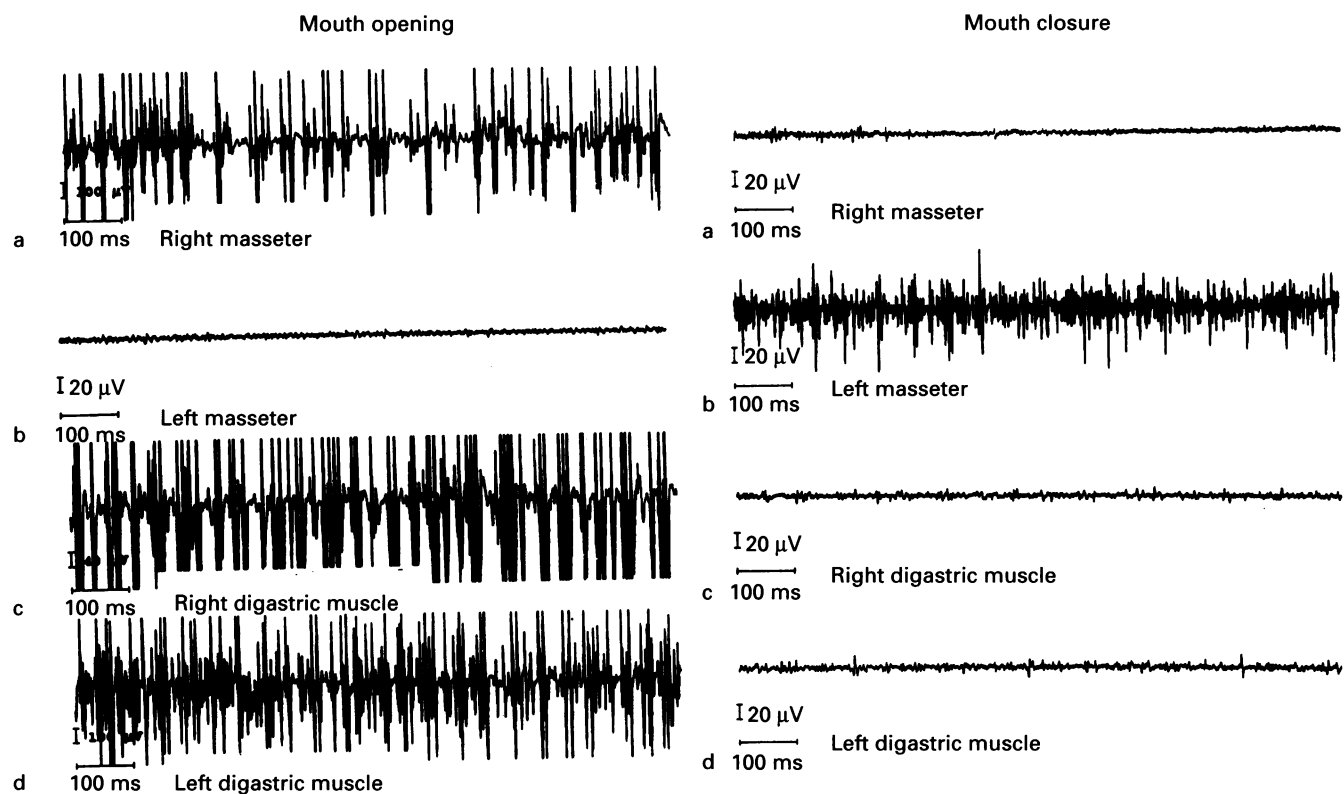
Botulinum toxin treatment is recommended as a simple, safe, and effective

method in the management of paradoxical activity of jaw muscles.

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EMG polygraphy in paradoxical activity of jaw muscles using concentric needle electrodes. (A (a-d)) Paradoxical activation of the right masseter and normal activation of both digastric muscles when the patient intends to open his mouth. (B (a-d)) Lack of activation of the right masseter during mouth closure.

Treatment of severe tetanus by continuous intrathecal infusion of baclofen

A 72 year old woman with dysphagia and stiffness of the shoulders and the neck was diagnosed as having tetanus from EMG and clinical symptoms. We were not able to identify a wound as the likely source of infection. Her vaccination history was unclear, but she had not received any booster injection in the past 10 years.

Treatment was started after two days and after a further two days she developed generalised, spontaneous, and provoked tonic muscle contractions leading to trismus, opisthotonus, risus sardonius, and acute respiratory failure. We immediately started symptomatic treatment with mechanical ventilation and continuous midazolam and vecuronium. In addition to sedation and neuromuscular blockade antihypertensive treatment with urapidil and β -receptor

blocking agents was necessary between days 2 and 7 and from day 19 until discharge from the intensive care unit. Specific intravenous treatment against causative *Clostridium tetani* consisted of penicillin G (20 million u/day) and human antitetanus immunoglobulin (10 000 U/day) on days 1 to 5. Antitetanus immunoglobulin was also given via the intrathecal route on days 15 and 16 (2000 U/day).

Complete resolution of the tonic muscle