Articaine: friend or foe?

Articaine and neurotoxicity – a review

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Local anaesthetics are the most commonly used drugs in dentistry. From our undergraduate days through to the day we 'hang up our handpieces', dentists administer countless infiltrations and blocks. We could not work effectively without them, but just like any drug, they do have some risks.

The mechanism of action of local anaesthetics is well understood. A blocking of the sodium ion channels prevents an action potential from starting, causing a temporary local numbness. This leads to a happy, relaxed patient and so a happy, relaxed dentist. In general, local anaesthetics are very safe agents. However, in some cases an abnormally long alteration/sensation is still present after the expected duration. This is called paresthesia, and may be temporary or permanent.

Every anaesthetic has the possibility of being neurotoxic. Studies in the past have looked at the incidence of paresthesia following local anaesthetics. Some studies have shown there to be an increased frequency of paresthesia after injection with articaine. In this paper, the authors carried out a literature review of possible neurotoxicity after use of articaine. A total of 20 clinical and *in vitro* studies were investigated.

In summary, the results of the review are as follows:

- The majority of the cases of paresthesia were observed after the administration of articaine (rather than other tested compounds)
- The market share for this anaesthetic was less compared to other anaesthetics, which meant an overrepresentation of paresthesia if articaine was used
- The incidence of paresthesia after administration of articaine showed no difference between men and women
- In the majority of the cases, paresthesia was observed after a mandibular block. The tongue was most frequently affected, followed by the lower lip and chin.

Toxicity of anaesthetics has also been investigated in animal and cell culture studies. Articaine induced a higher inflammatory reaction than lidocaine but was comparable ▸▸

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Expert view

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Local anaesthetic is used in vast quantities on a daily basis by dentists worldwide. It is estimated that around 70 million cartridges of dental local anaesthesia are used in the UK every year.[1] One of the most remarkable aspects about local anaesthesia (lignocaine, articaine and prilocaine being the mainstay of dental anaesthesia) is the safety profile of these drugs. The number of adverse reactions relating to local anaesthetic in dentistry is small, and true allergy to the actual anaesthetic agents (rather than the preservatives or latex in the bung in times gone by) is almost unheard of.[1,2] One of the recognised complications of local anaesthetic is nerve damage causing paraesthesia. The frequency of nerve damage (paraesthesia) related to local anaesthetic block injections is estimated to be between 1:14,000 and 1:609,000.[3–5]

This thorough literature review looks at neurotoxicity relating to articaine in both clinical and animal studies. They compare the market share of articaine with the percentage of paraesthesia cases related to articaine. The lingual nerve appears to be more frequently affected than the inferior dental nerve in cases of paraesthesia. The authors find some contradiction in the evidence base; retrospective studies suggest a higher risk of paraesthesia when using 4% articaine when compared to other anaesthetic agents; however, the animal models of neurotoxicity do not support this finding.

The authors cite a ruling from a Dutch court on the use of articaine with adrenaline (epinephrine). However, this does not specifically relate to neurotoxicity; it is more focused on the way in which the dentist managed the patient whilst they were clearly experiencing complications relating to the local anaesthetic.

The message relating to articaine is that its use in inferior dental nerve blocks is not advocated and other agents should be considered instead.[5]

In summary, the profession should value local anaesthetic as an extremely useful tool to enable us to do our jobs effectively and efficiently. I for one would not get many patients through the door as an oral surgeon without these remarkable drugs! ■

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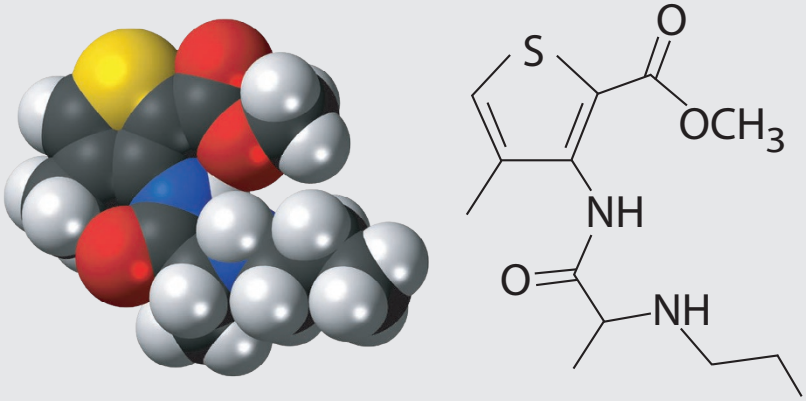


ARTICAINE IS A LOCAL ANAESTHETIC WITH A DIFFERENT CHEMICAL STRUCTURE TO MOST OTHER AMIDE ANAESTHETICS

Articaine is generally used in higher concentrations

Some studies suggest a higher risk of paresthesia with articaine when compared to other anaesthetics

IN ANIMAL STUDIES, ARTICAINE DID NOT HAVE A HIGHER TOXICITY COMPARED TO OTHER AMIDE-ANAESTHETICS

IT IS IMPORTANT TO REMEMBER THAT ARTICAINE IS VERY SAFE

The occurrence of a persistent sensitivity disorder after administration of local anaesthesia is very rare

IN THE UK BETWEEN 1998-2008, INCIDENCE OF PARESTHESIA AFTER USE OF ARTICAINE WAS ESTIMATED 1 : 1,684,133

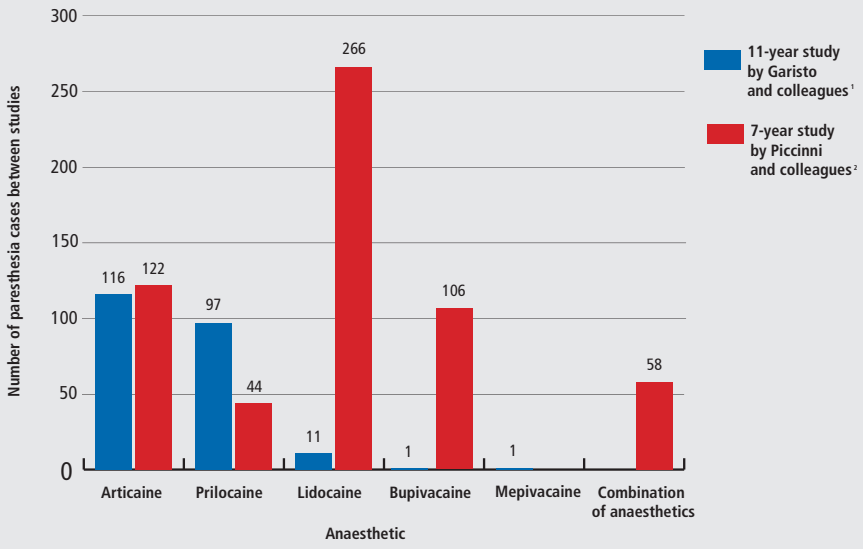
with the other anaesthetics investigated. Recently, an animal study was performed on the toxicity of articaine and lidocaine in rats. The inflammatory response in the rats injected with articaine did not differ from the group that received a lidocaine injection.

In most retrospective investigations of paresthesia cases, an overrepresentation of articaine has been reported relative to its market share. A possible explanation is that articaine is used at a 4% concentration, a higher concentration than most other anaesthetics.

Articaine could, because of its different chemical structure, have a higher intrinsic neurotoxicity than other anaesthetics at equal concentrations. However, both animal and *in vitro* investigations do not support this suggestion.

By Majed Kahal

An example of the big differences in results between studies



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Author Q&A

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What made you review this topic?

In the Netherlands, there is a natural healer who has campaigned against the use of articaine for more than a decade. She has even established a foundation for the so-called 'victims of articaine'. This foundation attributes many health problems to the use of articaine. They have generated a lot of attention in the media, including national television stations. As a result, Dutch dentists and the Academic Centre of Dentistry Amsterdam are frequently confronted with patients who are concerned about the use of this anaesthetic. Persistent sensitivity disorders are among the health problems attributed to the use of articaine. Therefore, we were pleased that one of our co-authors on this review, Alan Hopman, was willing to perform a systematic inventory of the available scientific literature on this topic for his Masters thesis.

What do general dental practitioners need to know about articaine?

General dental practitioners should realise that persistent sensitivity disorders are very rare after administration of any type of local anaesthetic. Retrospective studies have presented conflicting results whether administration of articaine, used in a concentration of 4%, is associated with a higher risk of paresthesia compared with other anaesthetics used at lower concentrations. *In vitro* studies and animal studies found no evidence for an increased toxicity of articaine compared to other anaesthetics. Despite the limited evidence for an increased incidence of paresthesia after administration of articaine, it seems wise to take objections of patients against this anesthetic seriously. ■

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