Reaction to aluminium in vaccines

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Abstract

Some children can develop nodules at the site of their immunisations. These are granulomas due to a reaction with aluminium which is present in some vaccines. The nodules are benign and further investigations are not needed. The nodules can cause intense itching and treatment is aimed at treating this until the nodules resolve on their own.

Keywords: aluminium, vaccines, reactions

Case Study

An 18-month-old female of Asian ethnicity born and living in the UK developed multiple palpable lumps under her skin at the site of her immunisations (outer aspects of both upper thigh). Her mother was unsure how long they had been there for. She came across them as she had noticed her scratching at those areas frequently. The skin there had become inflamed and excoriated. At times, for example when in the bath the skin would bleed due to scratching. On examination there were no other lumps elsewhere and on systems review the child had no other symptoms and no history of note. There was no family history of atopy.

The mother was concerned that the lumps were due to cancer. The doctor (a newly qualified General Practitioner (GP)) had never come across this presentation before and did not make any connection with her immunisations. The GP referred the child in to paediatrics and also did some research.

It transpired that the child had granulomas associated with aluminium which is used as an adjuvant in certain vaccines.

Pathophysiology

The nodules occur as the body is reacting to the aluminium. This is an autoimmune reaction and a type of contact allergy. The body is trying to remove the aluminium.

It is a very rare reaction (incidence unknown) (i).

The nodules can appear quite late after the vaccinations (months or even years). Histology demonstrates aluminium crystals within the granulomas (ii).

Diagnosis

This is often a clinical diagnosis. However, in the past in some cases the nodules were mistaken for tumours which led to unnecessary anxiety for parents, investigations and even surgery. When investigations have been done contact allergy has been verified by epicutaneous testing with aluminium chloride hexahydrate 2% and metallic aluminium.

Immunisation schedule

In the UK, the immunisation schedule is detailed in Table 1 (iii).

Menitorix and MMRVaxPro do not contain aluminium. The vast majority of other immunisations in the primary schedule do (iv).

4 in 1 or 6 in 1 vaccinations do contain aluminium so include Infanrix Hexa, Infanrix/IPV + hib, Boostrix IPV and Revaxis.

If the symptoms have completely resolved well before the vaccination is due then it should be safe to give the vaccine but administering aluminium based vaccines when the pruritis and irritation reaction is ongoing may worsen things (v).

Risk factors for developing granulomas

These granulomas have been described since 1960 (vi) but their incidence has increased. In the 1990's, 745 out of 76,000 children in Sweden had this reaction (vii).

The risk for granulomas increases with the number of aluminium containing vaccine doses. Other factors which may increase the risk are prematurity and having siblings with granulomas(viii).

Overall little is known about why certain children develop this reaction and other don't and this is an area where more research is needed.

Symptoms

Intense pruritis is the main symptom. This is often worse when the child is unwell with a cold or other infection or if warm/hot (for example in the bath) (ix). The itching causes small firm nodules which can be felt under the skin and when they appear cause more itching and a vicious cycle ensues. The itching also causes the nodules to become swollen so they are more prominent.

Skin changes such as eczema, hypertrichosis and hyperpigmentation are common(viii) and often alert parents to check the area and find the nodules.

In addition, most children then become sensitized against aluminium although fortunately this does seem to improve over time (x). Products that have also been reported to cause a reaction are aluminium containing deodorants, ear drops, antiseptics, sun protectors, tattooing pigments and the metal aluminium itself.

Treatment Options

Fortunately, this condition is self-limiting. Treatment is aimed at alleviating the intense itching

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Duoderm patches are very effective at protecting the skin and are waterproof and discreet too. Reasonably potent topical steroids such as mometasone can also help as well as liberal emollient use(xi). In particular, anti-itching preparations such as balneum plus can help soothe the itching. Anti-histamine use especially sedative varieties aren't recommended or practical as the itching is a constant long-term symptom.

Steroid injections can help but are often not carried out as it would need to be done under ultrasound guidance and under general anaesthetic in a child who is unable to stay still. For the same reason and also because of the benign nature and the risk of significant scarring, excision of the granulomas is not recommended.

Table 1

	AGAINST		
8 weeks old	Diphtheria, tetanus, pertussis, polio, Haemophilus influenzae type b (Hib) and hepatitis B	DTaP/IPV/Hib/HepB	Infanrix hexa or Vaxelis
	Meningococcal group B (MenB)	MenB	Bexsero
	Rotavirus gastroenteritis	Rotavirus	Rotarix
12 weeks old	Diphtheria, tetanus, pertussis, polio, Hib and hepatitis B	DTaP/IPV/Hib/HepB	Infanrix hexa or Vaxelis
	Pneumococcal	Pneumococcal conjugate vaccine (PCV)	Prevenar 13
	Rotavirus gastroenteritis	Rotavirus	Rotarix
16 weeks old	Diphtheria, tetanus, pertussis, polio, Hib and hepatitis B	DTaP/IPV/Hib/HepB	Infanrix hexa or Vaxelis
	MenB	MenB	Bexsero
1 year old	Hib and Meningococcal group C (MenC)	Hib/MenC	Menitorix
	Pneumococcal	PCV booster	Prevenar 13
	Measles, mumps and rubella (MMR)	MMR	MMRvaxPro or Priorix
	MenB	MenB booster	Bexsero
3 years 4 months old	Diphtheria, tetanus, pertussis and polio	DTaP/IPV	Boostrix IPV
	MMR	MMR	MMRvaxPro or Priorix
12 to 13 years old	Cancers and genital warts caused by specific human papillomavirus (HPV) types	HPV	Gardasil 9
14 years old	Tetanus, diphtheria and polio	Td/IPV	Revaxis
	Meningococcal groups A, C, W and Y	MenACWY	Nimenrix

Prognosis

Aluminium granulomas are benign and self-limiting.

Most of these granulomas do resolve and once they disappear the itching also stops. However, the time this takes is extremely variable (0.5 to 12 years, median 3-4 years)(v).

It is important to avoid further aluminium containing vaccines especially if existing granulomas are still present as those will exacerbate them and can lead to formation of new granulomas. This may mean that certain vaccines in the schedule are missed. This doesn't often pose a huge risk to the child especially if booster doses are omitted due to the effects of herd immunity. Subsequent doses can also be postponed up to 6-12 months(v). It can be helpful to get individual advice from a paediatric immunologist as each child is different. Also, more studies are needed in this area.

Conclusion

Most health care professional are unaware about aluminium associated granulomas. It is therefore important to educate those who see children, on this topic as it is easy to recognise once you know about them. As they are a benign and self-limiting condition it can significantly reduce anxiety in parents and avoid unnecessary investigations and interventions for the child. Symptomatic relief of the intense pruritis is the mainstay of treatment.

Abbreviations

GP: General Practitioner
Hib: Haemophilus influenzae type B
MenB: Meningococcal group B
PCV: Pneumococcal conjugate vaccine
MenC: Meningococcal group C
MMR: Measles, mumps and rubella
HPV: Human papillomavirus

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