

Excruciating pain and itching occurring at the administration site after intravenous injection of dexamethasone - a prospective clinical study

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Abstract: Dexamethasone is been used preoperatively before many minor surgical procedures. It is believed that single dose of dexamethasone as premedication does not cause any side effect. However during our study conducted on the aftereffect of intravenous administration of dexamethasone an unusual side effect of itching and burning sensation around abdomen occurred.

Keywords: steroids, dexamethasone, itching

I. Introduction

Corticosteroids are important and commonly used medications because of their potent anti-inflammatory and immunosuppressive properties, These have been a mainstay of treatment for many conditions, including rheumatological conditions (eg, rheumatoid arthritis temporal arteritis, polymyalgia rheumatica, systemic lupus erythematosus [SLE]), allergic reactions hepatitis obstructive lung diseases (eg, asthma, chronic obstructive pulmonary disease), and inflammatory bowel diseases¹. Moreover glucocorticoids are being used pre-operatively before minor surgical procedures to decrease post operative edema by inhibiting the release of pain mediators. However it is shown to cause certain post injection discomfort. Intravenous injection of dexamethasone causes transient decrease in blood potassium levels which results in post-injection itching and burning sensation¹.

II. Materials & Methods

For this study, 200 patients (including 100 males and 100 females) who required minor oral surgical treatment were selected. Written consent was obtained from these patients, Pre-operatively patient's serum sodium and potassium levels were evaluated and recorded. Before initiating the minor oral surgical procedure 2ml of 8mg Dexamethasone injection was given intravenously using 22 gauge needle attached to 5ml leurlok syringes. Post injection, the patient was enquired for the presence or absence of itching and pain in the region of injection. The time of onset of the pain and duration of the pain was noted in all the patients of either group. The time of onset was defined as a time when patient reported the pain or pruritis immediately after complete administration of dexamethasone. The intensity of pain was assessed with 11 point Numeric pain scale (NPS) (0-10 cm pain score) and Simple descriptive pain intensity scale (SDP) (no pain, mild pain, moderate pain and Severe pain). P value of <0.05 was considered as significant. A Chi-Square test was applied for defining statistically significant pain. Any other adverse effect like appearance of erythema, rashes or induration was noted. Following which patient's blood was withdrawn and sodium and potassium levels were evaluated. The readings obtained were tabulated and analysed.

III. Results

Table 1 shows that the two groups were similar with respect to age, weight and height. Seventy percentile male patients suffered no pain as compared to 43% female patients ($p < 0.05$). Only 30% male patients had suffered pain as compared to 57% female patients. The incidence of itching at administration site was similar in both groups (36% vs 48%) although it was individually significant (Table 2). The mean time of onset of pain/ pruritis was 11 seconds in group 1 and 6 seconds in group 2. The mean duration of persistence of pain/ itching was 19 seconds and 22 seconds in group 1 and 2 respectively.

Pain	Group1 (n=100 males)		Group2(n=100 females)	
	No. of patients	Percentage	No. of patients	Percentage
No pain	70	70%	43	43%
Pain	30	30%	57	57%
Itching	36	36%	48	48%
Any other side effect	0	0	0	0

Parameters	Group 1	Group 2
Mean age	26±3.6	23±2.6
Mean weight	58.6±4.3	49.8±3.8
Mean height	168±3.1	160±2.8

Parameters	Group 1	Group 2
Mean onset (sec)	11±1.7	6±0.6
Mean duration (sec)	19±1.3	22±1.8

IV. Discussion

Dexamethasone is a synthetic adrenocorticosteroid with glucocorticoid activity. It is one of the most active glucocorticoids, being about 25 to 30 times as potent as hydrocortisone. Unlike hydrocortisone, dexamethasone had little if any mineralocorticoid activity². DBL™ Dexamethasone Sodium Phosphate injection is a clear colourless solution, free from visible particulate matter. Each millilitre of solution contains dexamethasone sodium phosphate equivalent to 4 mg of dexamethasone phosphate. The 8mg/2ml vial formulation contains sodium citrate, disodium edetate and sodium sulphite Anhydrous³. No preservatives are present. Dexamethasone phosphate (or sodium) is absorbed rapidly following intramuscular or intravenous injection. Intramuscular injections of dexamethasone phosphate give maximum plasma concentrations of dexamethasone at 1 hour. The biological half life of dexamethasone is about 190 minutes. In the circulation, small amounts of dexamethasone are bound to plasma protein. Synthetic corticosteroids such as dexamethasone are less extensively protein bound and more slowly metabolised than hydrocortisone⁵. Dexamethasone penetrates into tissue fluids and cerebrospinal fluids. Metabolism occurs in most tissues, but primarily in the liver. The inactive metabolites are excreted in the urine, mainly as glucuronides and sulphates, but also as unconjugated metabolites⁶. Small amounts of unchanged drug are also excreted in the urine. Up to 65% of a dose of dexamethasone is excreted in the urine within 24 hours¹⁰.

Perron et al. [3,11] performed a small prospective study in which 20 patients experienced pruritis in many patients after the administration of intravenous dexamethasone sodium phosphate⁴. The authors further tried to find the association between appearance of pruritis and female sex but concluded the study with recommendation that steroid should be diluted in 50 ml saline and must be administered in 5-10 minutes. Their results are also similar to the present study where the incidence of perineal pruritis was more in group 2 (female patients) and it was statistically significant ($p < 0.05$). The pharmacological mechanism explaining this phenomenon remains poorly understood, but could be related to the phosphate ester of the corticosteroid since perineal irritation has been described with hydrocortisone-21-phosphate sodium and prednisolone phosphate⁶. No detailed explanations is mentioned even on intensive medline search. It has been explained that the pathogenesis of perineal pruritis/ pain has been may be related to corticosteroid phosphate esters such as dexamethasone sodium phosphate (as used in our cases) to cause perineal pain and irritation Also itching at the site of administration is said to occur due to transient mild hypokalemia which is usually observed after I.V administration. This is because 5% of potassium is present in blood vessels⁸. Both the incidence and severity may increase as the organic phosphate content of the injection increases. The lesser duration of pain might be due to hydrolysis of compound to phosphate ions and dexamethasone⁷. However, the pathophysiology of this rare side-effect still remains unknown and further research is required. Fortunately this adverse effect diminishes on its own as the compound is hydrolysed and it has not produced any postoperative prolonged effect.

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