Management of Patients at Risk of Adrenal Crisis in the Dental Setting: A Review of Current Practice in UK Dental Teaching Hospitals

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ABSTRACT

Introduction: Patients with impaired corticosteroid response due to Addison's or systemic glucocorticoid use are at risk of adrenal crisis when undergoing dental treatment. There is a lack of conclusive evidence to support dental teams in identifying patients at risk and their management to prevent an adrenal crisis.

Aim: To review the current practice in UK Dental Teaching Hospitals regarding the management of patients at risk of adrenal crisis in the dental setting.

Methods: An electronic survey focused on patients who may be at risk of adrenal crisis due to systemic glucocorticoid therapy was sent to all 18 UK Dental Teaching Hospitals. Information on the use of a policy or guidance was requested. Responses were evaluated for clinical decision making, patient risk assessment, and steroid cover dosing regimens.

Results: A 78% response rate was achieved. Only 29% of institutions had a written policy or guidance document. Variation exists in the threshold of steroid dose and duration of treatment in identifying patients at risk of adrenal suppression. Furthermore, the dose regime for steroid cover varied.

Conclusion: Further evidence on the management of patients at risk of adrenal crisis is required to inform national guidance and reduce variation in patient management.

IN BRIEF

- The majority of UK Dental Teaching Hospitals do not have a local policy or guidance document to support clinical decision making in the management of patients at risk of adrenal crisis in the dental setting
- Across the UK there is variation in the management of patients at risk of adrenal crisis in the dental setting, and sources of reference used by institutions provide differing recommendations
- This survey supports the need for evidence review, further studies and the development of pragmatic national guidance to reduce variation in practice, support the dental team with clinical decision making and improve safety of patients who may be at risk of adrenal crisis

INTRODUCTION

Patients with Addison's disease are at risk of an adrenal crisis in the perioperative phase due reduced corticosteroid production and resulting lack of corticosteroid response to the physiological stress caused by surgery. Decreased production of corticosteroids also occurs following therapeutic use of glucocorticoids for long periods of time. Systemic glucocorticoid therapy is common in specialties such as rheumatology, gastroenterology and dermatology where they are prescribed for their anti-inflammatory and immunosuppressive properties. Adrenal suppression secondary to systemic glucocorticoid use is the most common cause of adrenal insufficiency.

Most recent evidence would suggest that patients taking 5mg prednisolone or more, for one month or longer, may be at risk of adrenal insufficiency[1,2]. Approximately 7 in 1000 people are prescribed long-term glucocorticoid therapy, creating a large population of patients that require further consideration in the dental setting[3].

Impairment of corticosteroid production predisposes patients to significant life-threatening hypotension, the so-called Adrenal Crisis, following physiological stress, as their normal

corticosteroid response is insufficient, or absent. Adrenal crisis is a medical emergency that requires prompt diagnosis and hospital admission. Patients at risk of adrenal crisis require consideration for steroid replacement within the dental setting to prevent this occurrence.

A challenge for the dental team is identifying patients who have adrenal suppression. Patients with a known diagnosis of adrenal suppression are often well informed of their condition and knowledgeable about the need for supplementary glucocorticoids. However, awareness among patients taking glucocorticoid doses for immunosuppressive and anti-inflammatory benefits at doses thought to cause adrenal suppression, is lacking[4].

In 2003, a survey of UK Dental Teaching hospitals current practice in management of patients taking therapeutic doses of corticosteroids, aimed to reach a consensus regarding indications for steroid cover and doses[5]. They demonstrated that practice varied across institutions and concluded that national evidence-based guidance was required.

Almost twenty years later, there remains a lack of conclusive evidence on this clinical problem on which to base robust guidance.

AIM

The aim of this study was to review the current practice in Dental Teaching Hospitals in the UK regarding the management of patients at risk of adrenal crisis in the dental setting since the publication of key guidance documents[6,7,8].

METHODS

An electronic survey request was emailed to all the UK Dental Schools via the Association of British Academic Oral and Maxillofacial Surgeons (ABAOMS) Educational Committee (n=18). The survey requested information on the use of written policy or guidance on the management of patients at risk of adrenal crisis in each institution, and how patients at risk of adrenal crisis were identified and managed. Specifically, we sought information on patients who may be at risk of adrenal crisis due to taking systemic glucocorticoids and not those who

had primary forms of adrenal insufficiency such as Addison's Disease. Responses were evaluated for use of a policy/guidance document, evidence or references used during clinical decision making, factors for identifying patients at risk and threshold for steroid cover and dosing regimen.

RESULTS

Use of a local policy or guideline for the management of patients at risk of adrenal crisis

Of the 18 institutions contacted, 14 completed the online survey (78%). Only 29% of institutions had a written policy or guideline for the management of patients at risk of adrenal crisis undergoing dental treatment under local anaesthetic.

The institutions without a written policy cited the following as sources of reference:

- General Medical Practitioner (GMP)
- Consultant / patients' physician
- Local Endocrinology guidance
- Gibson et al, 2004[6]
- Addison's Disease Self Help Group Guidance[8]
- Association of Anaesthetists, Royal College of Physicians and Society for Endocrinology UK[7]
- British National Formulary (BNF)[9]
- Specialist Pharmacy Service (SPS) guidance[10]

Criteria used to identify patients at risk of adrenal crisis due to systemic glucocorticoid use

The threshold for identifying patients at risk of adrenal insufficiency varied from those taking doses of 5mg to 10mg of prednisolone (or equivalent) daily. The duration of systemic glucocorticoid use ranged from of daily for any length of time, up to a minimum duration of 3 months (table 1). Previous adrenal crisis was noted to identify those at risk.

School	Dose of glucocorticoid and duration of treatment responses in UK Dental Schools
1	*> 5mg prednisolone daily or equivalent for any duration, and any oral dose taken for > than 3 weeks*
2	*5mg prednisolone or equivalent for >3 weeks*
3	*5mg prednisolone for ≥ 1 month*
4	*> 5mg prednisolone for ≥3 months*
5	*> 7.5mg [prednisolone] but considered if long term and > 5mg particularly if previously on higher dose*
6	*>7.5mg prednisolone per day or equivalent*
7	*> 7.5 mg prednisolone for >1 month*
8	*Equivalent of 7.5mg prednisolone for > 1 month, currently or within last three months*
9	*>7.5mg prednisolone daily for at least 6 weeks.*
10	*10mg prednisolone or equivalent*
11	*10mg prednisolone or equivalent for >1 month*
12	*≥10mg prednisolone*
13	*long term low dose*
14	*current steroid dose and length of time on steroids/at that dose, previous adrenal crisis, complexity and length of planned procedure*

Table 1. Criteria used to identify patients at risk of adrenal crisis due to systemic glucocorticoid use in patients not diagnosed with adrenal insufficiency in UK Dental Schools.

Dosing regimen of supplemental steroids for patients identified as at risk of adrenal crisis

There was also considerable variation in the dosing schedule for steroid cover (table 2). Most institutions instructed patients to double their dose of steroid on the day of a dental procedure under local anaesthetic. Other options listed were to administer 100mg intramuscular (IM) hydrocortisone prior to the procedure, while some institutions administered only intravenous (IV) hydrocortisone. Responding institutions did not specify whether this was provided for all patients, or in specific situations only. Others advised patients to follow the sick day advice from their steroid prescriber, or the individual oral surgeons' preference.

School	Steroid dosing schedule for patients at risk of adrenal crisis without an adrenal insufficiency diagnosis
1	*no institution regime, subjective surgeon's approach*
2	*some clinicians double dose of steroids on day, depending on complexity of surgery*
3	*double oral dose on day of procedure*
4	*double dose or follow 'sick day' advice from prescriber*
5	*double dose of oral steroid on AM of procedure (and PM if they take it twice a day)*
6	*double AM dose and consider double dose for 24 hours*
7	*double oral dose for 24h or smaller proportional increase if clinically more appropriate*
8	*double oral dose prior to procedure and for 24h after. AM appointment - double morning dose. PM appointment - take normal morning dose and extra doubled oral dose at time of appointment.*
9	*double dose day of procedure and post op day*
10	*double dose day of procedure and post op day*
11	*surgical intervention with LA +\- IV sedation double prescribed oral steroid day of treatment*
12	*100mg IM hydrocortisone 20 mins pre-op or double the normal dose on the day, blood pressure monitoring during op*
13	*double dose of IV hydrocortisone (we no longer give IM hydrocortisone)*
14	*double AM dose or 25mg hydrocortisone IV*

Table 2. Steroid dosing schedule/regime for patients taking therapeutic glucocorticoids not known to have adrenal insufficiency but deemed to be at risk of an adrenal crisis during dental treatment under local anaesthetic in UK Dental Schools. (LA – Local anaesthetic, GA – General anaesthetic)

Influence of the type of procedure on provision of steroid cover

The type of procedure did not influence the need, or regime, for steroid cover in 36% of institutions. For the remaining 64%, the invasiveness and complexity of procedure and/or

patients anxiety influences the decision on provision of steroid cover (table 3). Surgeon preference was also reported, as well as reference to the ADSHG guidance[8] on categories of procedures.

School	Factors that influence the need or regime of steroid cover
1	*surgical procedures*
2	*more invasive procedures increase likelihood of steroid cover being recommended*
3	*Minor Oral surgery rather than routine dental procedures.*
4	*dental extractions double normal oral dose, GA requires parenteral steroid cover*
5	*mainly stressful procedure e.g. oral surgery, but would also consider for sedation patients with high anxiety*
6	*complexity and patient level of anxiety taken into account but not the deciding factor, would err on the side of caution*
7	*consider anxiety vs compliance, plus difficulty/length of the procedure*
8	*steroid cover given by anaesthetist with GA irrespective of procedure but LA it is determined by procedure. IV sedation sits in between, and different operators follow individual regimes*
9	*IM hydrocortisone for GA or significant OS procedure, for extractions double oral dose only. For other dental procedures follow ADSHG[8].*
10	*Patients*
11	*None*
12	*None*
13	*None*
14	*no institution regime, subjective surgeon's approach*

Table 3. The types of procedure and conditions that influence the need or regime of steroid cover in UK Dental Schools. (LA – Local anaesthetic, GA – General anaesthetic)

Other comments from survey respondents

Participants in the survey were invited to share any other information on the topic that felt relevant. They highlighted that adrenal crisis in the dental setting is a rare occurrence and felt

that dentistry was low risk. A lack of high-quality evidence was noted, and support for guidance development for this area was expressed. Participants also commented on the value of advice given by endocrinology colleagues.

DISCUSSION

Steroid cover policy across UK Dental Schools surveyed in 2003[5] showed variation in current practice and called for national based guidelines to support clinicians. 19 years later, in 2021, this survey shows that the situation remains unchanged.

The majority of institutions do not have a local policy. In the absence of guidance, clinicians stated that they sought advice from medical colleagues (GMP, Physicians, Endocrinology).

Gibson et al in 2004[6] first proposed guidance for the management of patients with Addison's disease and other forms of adrenal insufficiency in the dental setting. It remains one of the primary references for dentists when considering the risk of adrenal crisis during routine dental procedures and was reported as a reference used by clinicians responding to this survey. Gibson suggests that patients on long term steroid medication are at low risk of adrenal crisis and do not generally require steroid cover for dental procedures performed under local anaesthetic or may simply require to double the oral dose they are taking.

Some institutions reported the use of The Association of Anaesthetists 2020 guidelines[7] for the management of glucocorticoids during the peri-operative period for patients with adrenal insufficiency. This guidance provides a broad framework for prevention of adrenal crisis in at risk patients undergoing surgery, however dental surgery is not considered within this guidance.

The recently published Addison's Disease Self Help Group Surgical Guidelines[8] is also used by some institutions. This guidance suggests that routine dental procedures can be grouped depending on their invasiveness. Within the guidance, all types of dental procedures require patients at risk of adrenal insufficiency, including Addison's disease patients and those at risk of adrenal insufficiency through systemic glucocorticoid use, to have steroid cover prior to

their procedure. This ranges from an extra dose one hour prior to the procedure for minor dental surgery, to 100mg hydrocortisone IM injection before anaesthesia for “major” dental surgery. This is the only guideline that classifies all dental extractions as major surgery, whereas other policies considered here regard exodontia to be a minor surgical procedure. This guidance has significant implications for the management of patients at risk of adrenal crisis within the dental setting[11] and interestingly, only three of the responding institutions in this study reported the use of IM or IV hydrocortisone for procedures under local anaesthetic.

The above references, the SPS Pharmacy national guidance[10] and the BNF[9], were reported by some but not recognised by all respondents. The guidance within the BNF does not correlate with any of these publications, likely due to its relevance for general surgery rather than dental surgery.

Variation exists in identifying patients at risk of adrenal insufficiency from exogenous glucocorticoid use by assessment of their dose and duration of corticosteroid therapy. The minimum dose thresholds ranged from 5-10mg prednisolone daily, or equivalent, and the minimum duration ranged from any length of time up to 6 weeks. This variation is expected in the absence of evidence demonstrating the threshold for levels of therapeutic glucocorticoids that suppress the hypothalamic-pituitary-adrenal axis resulting in increased risk of adrenal insufficiency. Most institutions advise patients to double their oral dose of steroids on the day of surgery, however some provide IM hydrocortisone, and one institution provides IV hydrocortisone only. This demonstrates a large variation in the management of patients across institutions regarding the identification of those at risk of adrenal crisis, as well as the steroid cover provision.

The invasiveness and complexity of procedure influenced most institutions when treatment planning. Evidence exists to support this consideration. Cortisol secretion in the first 24 hours after surgery is correlated to the duration and extent of surgery, and rarely exceeds 200mg[12]. Saliva cortisol levels are higher in patients that have undergone dental extractions compared to restorative work, suggesting that more invasive procedures result in a greater physiological stress response[13].

Interestingly, some institutions also considered anxiety levels of patients and deemed those with high anxiety to be more at risk of adrenal crisis. Studies measuring the plasma cortisol levels of patients undergoing oral surgery procedures under general anaesthetic have shown that pre-operative apprehension is not a stimulus to adreno-cortical secretion, and that the post-operative stress response is due to pain and discomfort[14]. Assessment of patients attending an emergency dental care centre showed no correlation between salivary cortisol levels and anxiety[15]. However, more recent studies have shown emotional stress to be a precipitating factor in 20% of adrenal crisis incidents[16]. Therefore, further studies to understand how dental anxiety can contribute to an adrenal crisis in patients undergoing dental treatment is required.

Overall, our findings further support the need for a detailed review of evidence regarding the provision of steroid cover in dentistry, further studies in this area and the development of pragmatic national guidance. This would reduce the variation in management of patients at risk of adrenal crisis in the dental setting across the UK, support dental team members with their clinical decision making and improve patient safety.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

AUTHOR CONTRIBUTIONS

GG and CW designed the survey, analysed the data and prepared the manuscript. AB facilitated distribution of the survey. All authors reviewed and edited the manuscript, and approved the final version.

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