



PEARL

Uncontrolled hypertension at the dentist: a case report of integrated healthcare

Doble, Amazon; Bescos, Raul; Witton, Robert; Shivji, Shabir; Brookes, Zoë

Published in:
British Dental Journal

DOI:
[10.1038/s41415-023-6546-6](https://doi.org/10.1038/s41415-023-6546-6)

Publication date:
2023

Link:
[Link to publication in PEARL](#)

Citation for published version (APA):
Doble, A., Bescos, R., Witton, R., Shivji, S., & Brookes, Z. (2023). Uncontrolled hypertension at the dentist: a case report of integrated healthcare. *British Dental Journal*, 235(11), 866-868. <https://doi.org/10.1038/s41415-023-6546-6>

All content in PEARL is protected by copyright law. Author manuscripts are made available in accordance with publisher policies. Wherever possible please cite the published version using the details provided on the item record or document. In the absence of an open licence (e.g. Creative Commons), permissions for further reuse of content should be sought from the publisher or author.

Uncontrolled hypertension at the dentist: a case report of integrated healthcare

Amazon Doble,^{*1} Raul Bescos,² Robert Witton,¹ Shabir Shivji³ and Zoë Brookes¹

Key points

Blood pressure readings taken in clinical dental settings may serve as an additional approach for hypertension monitoring (and case finding) in individuals with high cardiovascular risk.

Dental primary care settings and dental professionals can provide accurate blood pressure readings and medical histories to make appropriate referrals to GPs regarding their patients' cardiovascular health.

Integrated dental-GP care pathways and referral networks could potentially reduce the risk of major cardiovascular events and associated mortality.

Abstract

Hypertension is a risk factor for major cardiovascular events and it is usually detected and managed by general medical practitioners (GPs) in primary care. However, it is estimated that 4.8 million adults are living with untreated high blood pressure (BP) in the UK. Health authorities are encouraging more collaborative work across health professions to find and refer individuals with undiagnosed hypertension. In this case, in 2022, a 65-year-old man with a previous history of hypertension, taking antihypertensive medication, attended a BP clinic at the University of Plymouth, Peninsula Dental School as part of a hypertension case finding pilot. His systolic and diastolic BP were 150 and 85 mmHg, respectively, and as per the trial protocol, a referral letter was sent to his GP for suspected further assessment and investigation. Then, an onward referral was made to secondary care and the participant was subsequently hospitalised for 13 days for treatment of heart failure and suspected acute coronary syndrome. This case report highlights that BP readings taken in a primary care dental setting can be very useful and recommends better integration of dental services into primary care to reduce the risk of major cardiovascular events.

Background

Hypertension in the UK refers to systolic blood pressure (BP) of ≥ 140 mmHg and a diastolic BP of ≥ 90 mmHg¹ and can be triggered by the combination of lifestyle factors and inherited susceptibilities.^{2,3} It is an important risk factor for major cardiovascular events (for example, stroke and heart disease).⁴ Lifestyle changes and pharmacological interventions are used by general medical practitioners (GPs) to prevent or manage hypertension and to reduce a person's risk of developing more severe cardiovascular disease states.^{2,4}

However, nearly 13% of treated hypertensive individuals do not respond to their medication⁵ despite following an aggressive pharmacological treatment, often including three or more anti-hypertensive medications (uncontrolled hypertension).^{6,7} Other recent reports estimate that the value can be even higher and up to 34% of people who receive treatment for hypertension do not achieve adequate BP control.⁷

Hypertension is widely encountered in primary care;⁸ however, there are underdeveloped referral pathways for detecting BP accurately outside of general practice. Initiatives to detect hypertension in non-GP settings remain controversial in terms of their human health benefits and are possibly unreliable, with fears they may exacerbate workload pressures on GPs at a time of unprecedented pressure within the NHS.⁹ Hypertension is usually diagnosed by GPs in primary care and it is based on clinical measurement of BP. People with suspected clinical hypertension are often offered ambulatory BP monitoring to confirm diagnosis of hypertension.¹⁰ NHS BP initiatives have been introduced in recent years to provide

more capacity for testing by individuals in their own homes, thereby reducing demand on NHS time.¹¹ However, many GPs prefer clinical measurements, as the clinical usefulness of home measurements is uncertain for several reasons, including reliability of readings, variability in devices, standardising protocols, training requirements and interpretation of results.¹²

Similar to GPs, dental settings can provide the clinical environment and training required to carry out BP readings correctly and effectively. Dental professionals are also trained in medical history taking and how to refer.¹³ Several studies are emerging recognising dental settings as an appropriate environment for detecting people with hypertension.^{14,15,16} Measurement of BP in the dental clinic may also be important, as many clinical decisions depend on hypertension status. For example, the choice of an appropriate anaesthetic and whether to perform certain invasive procedures require knowledge of the patient's BP.¹⁷ However, more research is required to understand the utility and wider benefits of hypertension case finding in dental settings and the most appropriate care pathways to support such initiatives.

¹Peninsula Dental School, University of Plymouth, UK; ²School of Health Professions, University of Plymouth, Plymouth, PL4 8AA, UK; ³Office of the Chief Dental Officer, London, SE1 6LH, UK.

*Correspondence to: Amazon Doble
Email address: amazon.doble@plymouth.ac.uk

Refereed Paper.

Submitted 21 April 2023

Revised 10 August 2023

Accepted 22 August 2023

<https://doi.org/10.1038/s41415-023-6546-6>

In this paper, we report detection of uncontrolled high BP within a primary care dental facility, resulting in a man being referred to his GP for above-threshold BP readings while using antihypertensive medication. The GP then referred this patient to the secondary care emergency department, where he was hospitalised and treated for heart failure and suspected acute coronary syndrome.

Case presentation

On 17 June 2022, a 65-year-old man attended a BP clinic at a University of Plymouth, Peninsula Dental School dental education site as part of a hypertension case finding pilot. The patient had a previous history of hypertension, diagnosed in the summer of 2013, and was currently taking the antihypertensive medication Candesartan (8 mg daily). The participant mentioned that he attended medical appointments with his GP or nurse every six months to check on his BP. The patient also had a home monitor to measure BP, although rarely used it. The case finding appointment was conducted on a separate day to any dental treatment to avoid dental anxiety influencing BP on the day.

A medical history was taken and alongside his prescription for candesartan 8 mg per day, the patient was taking Ibuprofen 800 mg 3–4 times per day and Paracetamol 500 mg three times per day as analgesia for neck and back pain. Other than a previous history of hypertension, pre-diabetes, sleep apnoea and neck pain, the participant answered 'no' to all other questions on our health questionnaire. However, the participant did mention that he had a persistent cough for the last few months. The participant underwent BP readings with dental clinic staff, involving BP readings taken after a 10-minute rest period on a bed in a quiet side surgery using the Microlife WatchBP Office monitor. Mean BP was calculated using an average of the lowest two

values out of three. His resultant mean arterial BP was 150/85 mmHg. No atrial fibrillation was detected, as displayed in Table 1. The participant was referred to their GP via a standard letter used in the pilot for further investigation.¹ The participant was also asked to contact their GP directly in case the letter was not received. As per our trial protocol previously published,¹⁸ the participant was also contacted 2.5 weeks after the appointment to assess whether they had followed-up with their GP and to determine whether a change of medication or other intervention had been made.

The participant had followed-up with their GP himself, 3–4 days after our recommendation. The participant also discussed with his GP his chest pain and shortness of breath.

The participant was subsequently referred onto the emergency department, where he was admitted into hospital on 23 June 2022, six days after his initial appointment with our team. The participant was admitted with shortness of breath, cough and pedal oedema, and remained in hospital for 13 days until his release on 4 July 2022.

While in hospital, the participant underwent numerous diagnostic tests, including x-ray, echocardiogram and computerised tomography coronary angiogram (CTCA). Low left ventricular systolic function was observed and the lateral walls appeared hypokinetic. However, ejection fractions were at 50–55%, remaining within a low-normal range.¹⁹ There was no evidence of significant vascular disease. D-dimer testing was negative, indicating no pulmonary embolism or deep vein thrombosis.²⁰ The participant's troponin was also negative, indicating a low-risk category for a serious cardiac event at the time of testing.²¹ After diagnostic testing, fluid in the patient's lung was detected, plus a leaking valve on the left side of the heart, with no blood clots being identified at the time. Consequently, the patient was treated for heart failure (HF) and suspected acute coronary syndrome (ACS), despite the CTCA being inconclusive.

Upon discharge on 4 July 2022, the participant was prescribed furosemide 40 mg plus aspirin 75 mg and scheduled to see a cardiologist ten days after his release. At this appointment, the cardiologist initially suggested to the patient that the high BP found at our clinic was most probably caused by dental anxiety. However, after 24-hour ambulatory BP monitoring, it was confirmed that the participant's BP was high, despite his antihypertensive medication. Alterations were made to his medication regimen, to taking

amitriptyline 10 mg per day, atorvastatin 20 mg per day, celecoxib 100 mg 1–2 times per day, codeine 30 mg 1–2 times per day, pregabalin 50 mg twice per day and sertraline 150 mg per day, along with continuation of the existing candesartan 8 mg per day.

The patient was further followed-up for six months by the dental team for the purpose of this case study. It was found that between August and September 2022, the participant was also diagnosed with hyperthyroidism (an overactive thyroid), which also increases BP.²² Unfortunately, the participant mentioned that the frequency at which he sees a medical professional for BP checks has not changed and that accessing GPs had been difficult. However, when the participant attends the pharmacy to collect prescriptions, he has continued BP assessments via this route, approximately once a month.

Discussion

This report has demonstrated that BP case finding at the dentist can be an effective and accurate approach to identify people with high cardiovascular risk. The case demonstrates integrated care, comprising a dental-GP-hospital network for case finding, which may have been lifesaving. The pharmacist then also entered this network of care, managing the follow-up BP measurements to assist with reducing burden on GPs. This network can offer several advantages, such as being reliable, clinically led and supports inter-professional collaboration and information sharing, which could have an advantage over 'on the go' settings of BP assessment, such as shopping centres.²³ Considering current time and resource pressures within the NHS, both being limited for healthcare professionals, it is important that GPs are not flooded with false positive results. To ensure accuracy, BP assessments were conducted at a separate appointment to dental treatment, and a rest period was incorporated, as per our previously published protocol.^{18,24} The influence of dental anxiety was considered minimal to none in this case, as patients attended a separate BP clinic to any dental appointments or surgery. However, the potential for white coat syndrome in other cases of BP recording in a dental setting have to be considered, as it does in any medical setting, and this can only be mitigated by ambulatory or seven-day home readings monitoring.¹

This report reveals more work needs to be done with GPs to raise awareness of the role of dental settings in case finding. This case also

Table 1 Referred participant characteristics

Participant characteristics	
Age (years)	65
BMI (kg/m ²)	40.6
Systolic BP (mmHg)	150
Diastolic BP (mmHg)	85
Sex	Male
Smoking status	Never
Vaping status	Never
Race	White

demonstrates that BP case finding within a dental school environment can identify people with continually high BP, despite using their antihypertensive medication, as well as case finding undiagnosed hypertension.¹⁸ Case finding initiatives, therefore, may also find individuals with hypertension where their medications are not optimal, and to our knowledge, this is not something that any previous studies within the dental setting has focused on. People with hypertension, that is inadequately controlled with antihypertensive medication, may be of high risk of an adverse cardiovascular event, as seen in this case, and it is recognised that inadequate control of hypertension can lead to more serious conditions.^{25,26} Given that hypertension presents as a large risk factor for HF and ACS, and that this patient was treated for these conditions after the initial referral from the dental setting, this case highlights the importance of case finding individuals with inadequate BP control.^{27,28}

Patient's perspective

The patient opted to read this report before publication and remarked 'after reading this report and findings, BP should be taken before dental treatment from the age of 50 onwards or with underlying health issues before having any treatment (that is, dental therapies). My feedback from my BP and talks with the PhD student on the project was rewarding and helpful. I was made at ease on both visits, thank you very much, and hope you have successful results in the future.' The patient described 'it is near impossible to get hold of the GP'.

Conclusions

In conclusion, this case study reports a secondary care medical intervention for a cardiovascular adverse event, resulting from case finding of uncontrolled hypertension at the dentist in primary care and referral from the GP. The initial measurements of BPs in the dental setting were proven to be accurate and fuelled subsequent lifesaving medical intervention in secondary care, together representing effective and integrated primary care between GPs and dental practitioners.

Ethics declaration

The authors declare no conflict of interest.

The study was conducted in accordance with the

University of Plymouth's ethics and approved by the Ethics Committee of the University of Plymouth (ethics code 2684 and 26/05/2021) for studies involving humans.

Informed and written consent was obtained from the patient for both the initial hypertension case finding trial appointment and publication of this case report.

Author contributions

Amazon Doble conducted case report initial follow-up. Amazon Doble and Zoë Brookes conducted the case report interview. Zoë Brookes, Raul Bescos and Robert Witton acquired the funds from the University of Plymouth. Amazon Doble, Raul Bescos, Robert Witton, Shabir Shivji and Zoë Brookes wrote and reviewed the manuscript. All authors have read and agreed to the published version of the manuscript.

Funding information

This research was funded by a Faculty of Health PhD studentship and HEIF funding from the University of Plymouth.

Acknowledgements

This study also operated in conjunction with Peninsula Dental Social Enterprise (PDSE) dental schools for the use of clinic facilities and computer integrated R4 systems to securely record and store patient data. The authors would like to thank PDSE staff, Aimee Matthews, Ana Tarzanyan and Louise Carr, and master's student, Tomas Nicholas, for aid with recruitment and data collection within PDSE dental schools. This study operated in conjunction with the University of Plymouth's Oral Microbiome Research Group (OMRG); equipment for anthropological measurements (blood pressure, BMI) was supplied within the OMRG group. Our study works in collaboration with the Office of the Chief Dental Officer in England and the CORE20PLUS5 programme.

References

- National Institute for Health and Care Excellence. Hypertension in adults: diagnosis and management. 2022. Available at <https://www.nice.org.uk/guidance/ng136> (accessed April 2023).
- World Health Organisation. Cardiovascular diseases. 2023. Available at https://www.who.int/health-topics/cardiovascular-diseases#tab=tab_1 (accessed April 2023).
- Anker D, Santos-Eggimann B, Santschi V *et al*. Screening and treatment of hypertension in older adults: less is more? *Public Health Rev* 2018; **39**: 26.
- Fuchs F D, Whelton P K. High Blood Pressure and Cardiovascular Disease. *Hypertension* 2020; **75**: 285–292.
- Achelrod D, Wenzel U, Frey S. Systematic review and meta-analysis of the prevalence of resistant hypertension in treated hypertensive populations. *Am J Hypertens* 2015; **28**: 355–361.
- Viera A J. Resistant hypertension. *J Am Board Fam Med* 2012; **25**: 487–495.
- Sheppard J P, Martin U, McManus R J. Diagnosis and management of resistant hypertension. *Heart* 2017; **103**: 1295–1302.
- Yaxley J P, Thambar S V. Resistant hypertension: an approach to management in primary care. *J Family Med Prim Care* 2015; **4**: 193–199.
- British Medical Association. Pressures in general practice data analysis. 2023. Available at <https://www.bma.org.uk/advice-and-support/nhs-delivery-and-workforce/pressures/pressures-in-general-practice-data-analysis> (accessed April 2023).
- Kim H M, Shin J. Role of home blood pressure monitoring in resistant hypertension. *Clin Hypertens* 2023; **29**: 2.
- NHS England. NHS offers home blood pressure checks to save thousands of lives. 2021. Available at <https://www.england.nhs.uk/2021/11/nhs-offers-home-blood-pressure-checks-to-save-thousands-of-lives/#:~:text=From%20October%202021%2C%20every%20NHS,at%20your%20loc> (accessed April 2023).
- Logan A G, Dunai A, McIsaac W J, Irvine M J, Tisler A. Attitudes of primary care physicians and their patients about home blood pressure monitoring in Ontario. *J Hypertens* 2008; **26**: 446–452.
- Creanor S, Millward B A, Demaine A *et al*. Patients attitudes towards screening for diabetes and other medical conditions in the dental setting. *Br Dent J* 2014; DOI: 10.1038/sj.bdj.2013.1247.
- Sproat C, Beheshti S, Harwood A N, Crossbie D. Should we screen for hypertension in general dental practice? *Br Dent J* 2009; **207**: 275–277.
- Kumar S, Ram H, Atam I *et al*. Detection of undiagnosed and inadequately treated high blood pressure in dentistry by screening. *Natl J Maxillofac Surg* 2020; **11**: 248–252.
- Engström S, Berne C, Gahnberg L, Svärdsudd K. Efficacy of screening for high blood pressure in dental health care. *BMC Public Health* 2011; **11**: 194.
- Southerland J H, Gill D G, Gangula P R, Halpern L R, Cardona C Y, Mouton C P. Dental management in patients with hypertension: challenges and solutions. *Clin Cosmet Investig Dent* 2016; **8**: 111–120.
- Doble A, Bescos R, Witton R, Shivji S, Ayres R, Brookes Z. A Case-Finding Protocol for High Cardiovascular Risk in a Primary Care Dental School-Model with Integrated Care. *Int J Environ Res Public Health* 2023; **20**: 4959.
- Yeboah J, Rodriguez C J, Qureshi W *et al*. Prognosis of Low Normal Left Ventricular Ejection Fraction in an Asymptomatic Population-based Adult Cohort: The Multiethnic Study of Atherosclerosis. *J Card Fail* 2017; **22**: 763–768.
- Douketis J. A negative D-dimer result and low risk clinical status effectively ruled out DVT in symptomatic patients. *BMJ Evid Based Med* 2000; **5**: 92.
- Hillis G S, Fox K A. Cardiac troponins in chest pain. *BMJ* 1999; **319**: 1451–1452.
- Prisant L M, Gujral J S, Mulloy A L. Hypertension: a secondary cause of isolated systolic hypertension. *J Clin Hypertens* 2006; **8**: 596–599.
- Edwards L A, Campbell P, Taylor D J, Shah R, Edgar D F, Crabb D P. Healthy shopper? Blood pressure testing in a shopping centre Pop-Up in England. *BMC Public Health* 2019; **19**: 42.
- Bescos R, Ashworth A, Cutler C *et al*. Effects of Chlorhexidine mouthwash on the oral microbiome. *Sci Rep* 2020; **10**: 5254.
- Schmieder R E, Ruilope L M. Blood pressure control in patients with comorbidities. *J Clin Hypertens* 2008; **10**: 624–631.
- Ohishi M. Hypertension with diabetes mellitus: physiology and pathology. *Hypertens Res* 2018; **41**: 389–393.
- Mayo Clinic. Acute coronary syndrome: symptoms and causes. 2023. Available at [https://www.mayoclinic.org/diseases-conditions/acute-coronary-syndrome/symptoms-causes/syc-20352136#:~:text=Acute%20coronary%20syndrome%20is%20a,damaged%20or%20\(accessed April 2023\)](https://www.mayoclinic.org/diseases-conditions/acute-coronary-syndrome/symptoms-causes/syc-20352136#:~:text=Acute%20coronary%20syndrome%20is%20a,damaged%20or%20(accessed April 2023)).
- Oh G C, Cho H-J. Blood pressure and heart failure. *Clin Hypertens* 2020; **26**: 1.