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Do Invasive Dental Procedures Cause Prosthetic Joint Infections (PJI)?

Submission date
25/05/2018

Recruitment status
No longer recruiting

Registration date
30/05/2018

Overall study status
Completed

Last Edited
15/03/2022

Condition category
Infections and Infestations

[_] Prospectively registered
[_] Protocol
[_] Statistical analysis plan
[X] Results
[_] Individual participant data

Plain English summary of protocol

Background and study aims
Prosthetic (artificial) replacement of poorly functioning, painful and diseased joints is now a common surgical procedure. However, late prosthetic joint infections (LPJI), caused by blood-borne bacteria (bacteremia), are a common complication with high morbidity, and potential mortality, as well as high treatment, patient and societal costs. In an attempt to reduce the risk of LPJI, dentists in some parts of the world (particularly the US) are recommended to routinely give prosthetic joint patients antibiotics before invasive dental procedures (IDP). This is called antibiotic prophylaxis (AP). The purpose of this is to reduce the risk of procedure-related bacteremia causing infection of the prosthetic joint. However, there is little evidence to demonstrate any association between IDP and LPJI and there is no clinical trial data demonstrating the efficacy, or not, of AP. Currently AP is not recommended in the UK for individuals with prosthetic joints but is in the US. Data proving or disproving any association between IDP and LPJI is urgently needed. If an association exists, then the widespread adoption of AP in the UK and elsewhere could help reduce the large number of LPJI cases and high associated treatment costs. In the US alone there are ~20,000 LPJI cases with a ~$566 million annual treatment cost. Alternatively, if no association exists, then AP is unnecessary and a clear recommendation against its use could be made. As AP is not currently recommended in the UK this would not have a significant impact other than reassuring clinicians and patients. In the US, and other countries where AP is the standard of care, however, stopping AP would save ~$60 million annually, avoid the risk of adverse reactions in those who currently receive AP and reduce the risk posed to society that AP unnecessarily promotes the development of antibiotic resistant bacteria.

Who can participate?
All individuals admitted to hospital for late prosthetic joint infections (LPJI) in England.

What does the study involve?
This study uses national hospital admissions data to identify all those individuals in England who developed a LPJI in the period between 1st April 2010 and the 31st March 2017 and link this to national dental treatment data to see if those who developed LPJI were more likely, or not, to have had an invasive dental procedure performed in the 3 months immediately preceding their LPJI than in any other 3 month period.

What are the possible benefits and risks of participating?
If this study demonstrates a link between invasive dental procedures and LPJI, this will provide support for the use of antibiotic prophylaxis (AP) before invasive dental procedures in patients with prosthetic joints. If no such link is identified, it will provide reassurance to those with prosthetic joints, their dentists and physicians, carers and those charged with providing guidance on such issues, that current UK guidance not to provide AP for those with prosthetic joints is correct.
In countries such as the US, where AP is recommended for those with prosthetic joints undergoing invasive dental procedures, the demonstration of a link between invasive dental procedures and LPJI would lend support for this guidance. On the other hand, if no link was demonstrated, it would provide support for the idea that AP might not be necessary.
While this research will not directly benefit individuals in the data set, it will help to improve evidence based dental care for all those with prosthetic joints. As it is an observational study, there is no direct risk for participants.

Where is the study run from?
University of Sheffield (UK)

When is the study starting and how long is it expected to run for?
May 2017 to August 2021

Who is funding the study?
National Institutes of Health (USA)

Who is the main contact?
Prof Martin Thornhill (Scientific)

Contact information

Type(s)
Scientific

Contact name
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Integrated Research Application System (IRAS)
246818

Protocol serial number
University of Sheffield 154006; NIH 1 R01 DE027917-01

Study information

Scientific Title
A retrospective, case-crossover design, observational study of English national data comparing the incidence of invasive dental procedures in the 3 months immediately preceding a late prosthetic joint infection (cases) with the incidence of invasive dental procedures in earlier 3-month control periods (3-6, 6-9 or 9-12 months before a late prosthetic joint infection)

Acronym
The PJI Study

Study objectives
Null hypothesis: There is no temporal association between invasive dental procedures and the development of late prosthetic joint infections (LPJI)

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approved 05/12/2018, NHS Health Research Authority, South Central – Hampshire B Research Ethics Committee (Level 3, Block B, Whitefriars, Lewins Mead, Bristol, BS1 2NT, UK; +44 (0)207 1048055; nrescommittee.southcentral-hampshire@nhs.net), ref: 18/SC/0387

Primary study design
Observational

Study design
Case crossover design observational study

Study type(s)
Prevention

Health condition(s) or problem(s) studied
Invasive dental procedures leading to development of late prosthetic joint infections

Interventions
We do not intend to contact patients or involve them personally with this research, the proposed research is an observational study only. It uses routinely collected national data for England.

The study will link national data on courses of dental treatment (NHS Business Service Authority Dental Database) and hospital admissions for prosthetic joint infection (Hospital Episode Statistics (HES) database) to investigate if there is a link between invasive dental procedures and the development of late prosthetic joint infections (LPJI) i.e. prosthetic joint infections occurring >3 months after joint placement.

NHS Digital is the HES data guardian. NHS Digital identifies all patients admitted to hospital between 1st April 2010 and 31st March 2017 (7 years) with a primary or secondary diagnosis of a joint infection using ICD-10 codes M00.0, M00.1, M00.2, M00.8, M00.9 - approximately 87,000 individuals. This data includes hospital admissions data for these individuals back to January 2000 and is later be used to confirm that the patient had a prosthetic joint inserted and that the joint was replaced more than 3 months prior to development of the joint infection i.e. those who fulfilled the criteria for LPJI. Such individuals are identified by searching the records of those identified as having a joint infection between 1st April 2010 and 31st March 2017 back to January 2000 for any admission for insertion of a prosthetic joint using OPCS-4 operative procedure codes W37-W51 more than 3 months before the joint infection admission. From the list of individuals admitted with a joint infection between 1st April 2010 and 31st March 2017, NHS Digital creates two datasets, linked by a unique study ID for each patient.

These datasets are:
Dataset 1: Contains patient identifiers and the unique study ID (but no HES clinical data). This is sent to managers of the NHS Business Services Authority (NHSBSA) Dental Database. NHSBSA identify the dental records for these patients. Included in this is the date of any course of dental treatment and whether the treatment included any extraction, endodontic treatment or a scale and polish i.e. any invasive dental procedure (IDP). NHSBSA remove the patient identifiers from this dataset but retain the unique study ID against each record i.e. they de-identify the data. The de-identified dental records of study patients (with just the unique study ID) are sent to the University of Sheffield study team. NHSBSA then securely destroy their copy of dataset 1 and notify NHS Digital of it's destruction.

Dataset 2: Contains the hospital admissions data for each patient back to January 2000 (this is necessary to confirm that the infection occurred in someone with a prosthetic joint and to enable the study team to identify those patients who had a prosthetic joint inserted >3 months before the joint infection) and the unique study ID (but no patient identifying information) i.e. it is de-identified data. This data is sent by NHS Digital to the University of Sheffield study team.

The University of Sheffield study team receive the de-identified Datasets 1 and 2. The data within the two de-identified data sets is then linked using the common unique study ID for each patient and this data is used for the study analysis. The University of Sheffield study team thus receive linked hospital admission and dental data but receive no patient identifying details and have no means of identifying patients from the unique study ID number.

Identifiable patient data is only transferred between the two NHS organsations (NHS Digital and NHSBSA). The study team at the University of Sheffield do not receive any patient identifiable data.
The research team at the University of Sheffield analyse the data according to the study protocol and report the results through peer reviewed journals, a report to NIH (who are funding the study) and conference proceedings.

Intervention Type
Other

Primary outcome(s)
Incidence of invasive dental procedures in the 3 months immediately preceding a late prosthetic joint infection (LPJI) (case period) compared to the frequency of invasive dental procedures in earlier 3 month control periods (3-6, 6-9 and 9-12 month before LPJI), measured by linking national hospital diagnosis and procedure data with national dental treatment data

Key secondary outcome(s)
LPJI free survival following a course of dental treatment involving an invasive dental procedure (cases) compared to LPJI free survival following a course of dental treatment NOT involving an invasive dental procedure (controls) measured by linking national hospital diagnosis and procedure data with national dental treatment data.
Invasive dental procedures are defined as extractions, dental scaling and endodontic (root canal) treatment.

Completion date
31/08/2021

Eligibility

Key inclusion criteria
1. Developed a prosthetic joint infection as a primary or secondary discharge diagnosis (ICD-10 codes M00.0, M00.1, M00.2, M00.8, M00.9)
2. >3 months after having had a prosthetic joint inserted (OPCS-4 codes W37-W51)

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
All

Sex
All

Total final enrolment
9427

Key exclusion criteria
Current exclusion criteria as of 12/11/2018:
1. NHS number is missing or cannot be derived using established algorithms from their other personally identifying data (name, date of birth, gender, address etc.). Any missing or corrupt records are also excluded
2. Prosthetic joint was inserted <3 months before the prosthetic joint infection are also excluded
3. Patients that do not want the confidential patient information held on them by NHS Digital (or NHSBSA) to be used in this, or other research, can use the National data opt-out programme (https://digital.nhs.uk/services/national-data-opt-out-programme) to have it excluded. Patients can find out more and set their opt-out choice at: https://www.nhs.uk/your-nhs-data-matters/.

Previous exclusion criteria:
1. NHS number is missing or cannot be derived using established algorithms from their other personally identifying data (name, date of birth, gender, address etc.). Any missing or corrupt records are also excluded

2. Prosthetic joint was inserted <3 months before the prosthetic joint infection are also excluded
3. Notified NHS Digital or NHSBSA that they do not wish their data to be shared for purposes other than their own direct care (known as a 'Type 2 Opt-Out')

Date of first enrolment
01/04/2010

Date of final enrolment
31/03/2017

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
University of Sheffield
United Kingdom
S10 2TA

Sponsor information

Organisation
University of Sheffield

ROR
https://ror.org/05krs5044

Funder(s)

Funder type
Government

Funder Name
National Institutes of Health

Alternative Name(s)
US National Institutes of Health, Institutos Nacionales de la Salud, NIH, USNIH

Funding Body Type

Government organisation

Funding Body Subtype
National government

Location
United States of America

Results and Publications

Individual participant data (IPD) sharing plan
The datasets generated during and/or analysed during the current study are not expected to be made available as this study links data from two English national data sets (i) the National Health Service (NHS) NHS Digital Hospital Episode Statistics database of hospital admission diagnoses and procedures and (ii) the NHS Business Services Authority (NHSBSA) dental database. Although these two NHS organisations use patient identifying information to link the data at the patient level, the data is then de-identified before being made available to the research team. The research team do not, therefore, have access to identifiable patient level data. Furthermore, it is a requirement of these two national data organisations that patient level data is not made available by researchers but remains entirely under the control and care of these organisations i. e. NHS Digital and NHSBSA.

IPD sharing plan summary
Not expected to be made available

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		04/01/2022	15/03/2022	Yes	No
HRA research summary			28/06/2023	No	No
Study website	Study website	11/11/2025	11/11/2025	No	Yes