Tooth extraction education at dental schools across Europe

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OBJECTIVES/AIMS: To explore students’ opinion about theoretical and clinical training in tooth extraction at different European dental schools.

MATERIALS AND METHODS: An online questionnaire, containing 36 dichotomous, multiple choice and Likert scale rating questions, was distributed among students of 56 different dental schools. After excluding schools where < 20 students responded, 656 questionnaires from 23 dental schools remained for statistical analysis.

RESULTS: Dental schools showed a wide variation in the initial practical teaching of tooth extraction, from years 2 to 6. Several schools used a preclinical training model, and most students considered this useful. Some students considered their knowledge about forceps and elevators insufficient (6–60%), as well as their preparation for complications (5–60%). Students usually had received education in forceps and elevator techniques. Inclusion of (non)surgical removal of retained roots and surgical removal of third molars showed a wide variety between dental schools. Less than half of the students reported education in surgical removal of impacted teeth. Students from four of the 23 dental schools felt insufficiently prepared in tooth extraction (Likert scale ≤ 3).

CONCLUSION: There is a wide variation among European dental schools in teaching programs of tooth extraction and the rating of these programs by students.

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INTRODUCTION

Tooth extractions are frequently performed in the general dental practice. Forceps exodontia of teeth is established as a basic clinical skill for dental graduates. During forceps exodontia, however, there is always the possibility of fracture of parts of the root and the necessity to start a surgical extraction. This means that graduating dentists must be competent in both surgical techniques. This is reflected in the current profile for the European dentist.1 Tooth extractions are mentioned in competences 6.53 and 6.54, which state that a dentist must be competent at ‘performing uncomplicated extraction of erupted teeth’ and ‘performing surgery for the uncomplicated removal of fractured or retained roots and the removal of uncomplicated partially erupted teeth’.

Various studies in the UK have evaluated the perceptions of recently graduated dentists about their preparedness to perform extractions in the dental practice. Almost all respondents perceived that the teaching at their dental school had given them sufficient knowledge to undertake simple forceps exodontia, but confidence levels to perform surgical extractions were considerably lower.2–8 Similar results were observed for graduates of the dental school of the University of Hong Kong. Eighty-nine per cent of the students felt well prepared to perform simple extractions and 62% felt well prepared to extract impacted third molars.9

Surveys among staff and students of dental schools across Europe have shown a considerable variation in dental curricula with regard to the teaching of local anaesthesia, tooth colour determination systems and fixed prosthodontics.10–13 This variation in teaching can influence the level of confidence of dental students, which may also apply when administering a tooth extraction in a patient. This suggestion is supported by the observation that students from the dental school in Cardiff in the UK were significantly more confident in performing simple extractions, as well as surgical extractions than students from the dental school in Cork in Ireland.6 Therefore, the aim of the present study was to explore the perception of students from different dental schools in Europe about their education in tooth extraction.

MATERIALS AND METHODS

This study is part of a series of studies performed by the Academic Centre of Dentistry Amsterdam, which explores the variation in curricula between dental schools across Europe.10–13 For the present study, an online questionnaire about the teaching of tooth extraction was developed. The first part of the questionnaire collected general information about dental school, gender and study year. In the second part, the extraction education of the student was explored with 36 dichotomous, multiple choice or rating scale questions. The opinion of the respondents about several aspects of the extraction education was rated with five-point Likert scales. A score of 1 meant ‘absolutely not’ or ‘very bad’ and a score of 5 did mean ‘absolutely’ or ‘very good’. The total number of questions to be answered depended on the student’s individual situation.

The questions were entered in the internet survey program eXamine 2.0.14 For the distribution of the questionnaire, the Deans of 145 dental schools who were member of the Association for Dental Education in Europe were approached. In addition, all delegates mentioned on the website of the European Dental Students Association were approached. A web link to the questionnaire was sent with an explanatory E-mail to the Deans and European Dental Students Association delegates, and they were asked to distribute the web link among all students of their dental school. The questionnaire was distributed in October and November 2011. The students were asked to answer the questionnaire within a period of 6 weeks. Participation was on a voluntary base, and all responses were anonymous.
The total number of respondents was 1,294 from 56 different dental schools in Europe. Questionnaires were considered useful when the respondent reported to have received education in tooth extraction and completed at least half of the questions. When 20 or more questionnaires from a dental school were returned or more than half of the students had returned the questionnaire the dental school was included in the analysis.

In general, students were quite satisfied with the provided material, with scores varying from 2.9 to 4.1 on a 5-point Likert scale. The use of a preclinical training model before the first extraction in a human is frequently reported by students from Cardiff, Gent, Kosice, Leeds, Nantes, Plymouth and Turku (Table 3). The majority of the students who used a preclinical training model considered it a useful preparation for the subsequent tooth extraction in a patient. However, in Cardiff and Ghent, only small numbers of students found the preclinical training model useful (27% and 36%, respectively).

Students feel relatively well prepared in several areas related to perform a tooth extraction. Some students felt that their knowledge about forceps and elevators was insufficient (6–60%), as well as their preparedness for complications (5–60%). Only few students from all dental schools felt insufficiently prepared with regard to anatomy, prescription of analgesics, medication problems or legal aspects of tooth extraction.

Supervision during the first tooth extraction in a patient was mostly performed by a dentist or oral-maxillofacial surgeon (Table 4). In general, students were quite satisfied with the supervision, with scores varying from 3.6 to 4.8.

There is a wide variation in specific extraction techniques included in the curricula of the surveyed dental schools (Table 5). A large majority of the students report that they have received education in forceps and elevator techniques (42%–100% and 44%–100%, respectively). For non-surgical and surgical removal of retained roots, as well as surgical removal of third molars, much larger differences between dental schools were observed (5%–83%, 6%–71% and 0%–80%, respectively). Only a minority of the students received education in surgical removal of impacted teeth (0–50%). The widest variety in extraction techniques seems to be provided by the dental schools in Copenhagen, Nantes, Szeged and Plymouth.

### Table 1. General characteristics of the responding students from 23 different European dental schools with regard to gender, study year and the year in which the students received the initial theoretical and practical teaching in extraction of teeth

| Dental school | Country       | Useful questionnaires | Male (%) | Study year (mean) | Initial teaching in year |
|---------------|---------------|-----------------------|----------|-------------------|--------------------------|
|               |               |                       |          | Theoretical (mean) | Practical (mean)          |
| Amsterdam     | The Netherlands | 53                    | 47       | 4.8               | 4                        |
| Bern          | Switzerland   | 20                    | 40       | 4.3               | 3                        |
| Bordeaux      | France        | 49                    | 41       | 5.2               | 3                        |
| Brest         | France        | 21                    | 57       | 3.8               | 2                        |
| Cardiff       | United Kingdom| 25                    | 24       | 4.3               | 3                        |
| Copenhagen    | Denmark       | 25                    | 24       | 5.0               | 4                        |
| Ghent         | Belgium       | 23                    | 35       | 5.1               | 4                        |
| Kaunas        | Lithuania     | 53                    | 23       | 4.1               | 4                        |
| Kosice        | Slovenia      | 21                    | 43       | 4.8               | 2                        |
| Leeds         | United Kingdom| 23                    | 52       | 4.3               | 3                        |
| London        | United Kingdom| 32                    | 38       | 4.7               | 3                        |
| Msida         | Malta         | 12                    | 50       | 4.3               | 3                        |
| Nantes        | France        | 23                    | 57       | 4.3               | 3                        |
| Nijmegen      | The Netherlands| 32                    | 22       | 4.8               | 3                        |
| Oslo          | Norway        | 21                    | 38       | 4.5               | 4                        |
| Plymouth      | United Kingdom| 21                    | 62       | 3.5               | 2                        |
| Rennes        | France        | 23                    | 48       | 4.8               | 3                        |
| Sofia         | Bulgaria      | 54                    | 41       | 4.7               | 3                        |
| Szeged        | Hungary       | 25                    | 40       | 4.4               | 3                        |
| Toulouse      | France        | 27                    | 56       | 5.2               | 3                        |
| Trieste       | Italy         | 25                    | 44       | 4.4               | 3                        |
| Turku         | Finland       | 23                    | 22       | 4.3               | 3                        |
| Ulm           | Germany       | 24                    | 38       | 4.6               | 3                        |

*Questionnaires were considered useful when the respondent reported to have received education in tooth extraction and completed at least half of the questions. When 20 or more questionnaires from a dental school were returned or more than half of the students had returned the questionnaire the dental school was included in the analysis.

# RESULTS

Table 1 presents general information about the respondents. In general, the percentage of male students is < 50%, and usually they are in the fourth year of the study. The teaching of the theoretical aspects of tooth extraction usually starts in year 3, with Brest, Kosice and Plymouth starting 1 year earlier. The initial teaching of the practical aspects has a much wider variation in the dental curricula, and ranges from year 2 (Plymouth) to 6 (Amsterdam).

Table 2 gives an overview of the study material used during teaching of tooth extraction. Most dental schools use one or more textbooks (18–100%) and handouts (9–96%). Readers (0–73%) and digital video discs or films (0–50%) are less frequently used.
Finally, Table 6 shows that students of dental schools across Europe vary considerably in their opinion whether they are properly trained in tooth extraction. Students from the dental school in Plymouth felt best prepared, closely followed by students from the dental schools in Szeged, Copenhagen, Trieste, Nantes and Sofia (all mean scores \( \geq 4 \)). The students from 4 of the 23 surveyed dental schools felt insufficiently trained in tooth extraction (mean scores \( \leq 3 \)). Students from the dental school in Szeged rated their training the highest (4.5), closely followed by students from the dental schools in Sofia and Plymouth. Students from 5 of the 23 surveyed dental schools were not very satisfied with the education in tooth extraction (mean scores \( \leq 3 \)). The mean opinion of students about the education at their dental school correlated significantly with the year in the curriculum of the initial teaching of the practical aspects of tooth extraction (\( r = -0.629, P = 0.001 \)). For the initial theoretical teaching, this relation with the overall satisfaction did not reach significance (\( r = -0.388, P = 0.067 \)).

DISCUSSION

The present study of dental students’ perceptions showed considerable variation among European dental schools in the teaching of tooth extraction and the rating of this teaching by students. This is in line with a previous study in the UK, showing variations between dental schools in content and delivery of the oral surgery clinical teaching programs. The undergraduate teaching of wisdom tooth removal in the UK showed also variation in the stage of the curriculum where this topic is taught.

The initial teaching of the practical aspects of tooth extraction varies considerably between European dental schools with regard
to study year (Table 1). The rating of the education at dental schools correlated negatively with the year of the initial teaching of the practical aspects of tooth extraction, indicating that an early clinical exposure is appreciated by the students. Early exposure may also increase the number of extractions achieved by dental students during their clinical years. In 2008, the minimum number of extractions that undergraduates were expected to achieve during their clinical years varied between 11 dental schools in the UK from 20 to 115.15 Shortage of suitable cases for undergraduates17 has been suggested to be one of the limits to develop confidence,6 as the number of surgical extractions performed increased competence.18 However, in another study, no significant relationship was observed between the total number of teeth extracted and the successful completion

Table 4. Supervision of students from 23 different European dental schools during their first tooth extraction, the background of the supervisor and the opinion of the students about the supervision (range 1 = absolutely not to 5 = absolutely)

| Dental school | No supervision | Dentist | Oral-maxillofacial surgeon | Other | Satisfied with supervision (range 1–5) |
|---------------|----------------|---------|--------------------------|-------|-------------------------------------|
| Amsterdam     | 7              | 96      | 33                       | 4     | 3.8 ± 1.2                           |
| Bern          | 0              | 90      | 10                       | 0     | 4.6 ± 0.5a                          |
| Bordeaux      | 7              | 79      | 4                        | 11    | 4.1 ± 1.2                           |
| Brest         | 0              | 100     | 0                        | 0     | 4.3 ± 0.9                           |
| Cardiff       | 9              | 55      | 18                       | 18    | 3.9 ± 1.2                           |
| Copenhagen    | 0              | 70      | 30                       | 0     | 4.2 ± 0.9                           |
| Ghent         | 21             | 52      | 21                       | 5     | 3.9 ± 1.0b                          |
| Kaunas        | 5              | 3       | 76                       | 16    | 4.1 ± 1.0                           |
| Kosice        | 6              | 11      | 83                       | 0     | 4.4 ± 0.9                           |
| Leeds         | 0              | 55      | 36                       | 9     | 4.4 ± 0.8                           |
| London        | 0              | 62      | 34                       | 3     | 4.0 ± 1.1                           |
| Msida         | 0              | 90      | 10                       | 0     | 4.7 ± 0.7a,g                        |
| Nantes        | 29             | 67      | 5                        | 0     | 4.5 ± 0.8a,g                        |
| Nijmegen      | 0              | 35      | 65                       | 0     | 4.1 ± 1.1                           |
| Oslo          | 0              | 92      | 8                        | 0     | 4.3 ± 0.9                           |
| Plymouth      | 0              | 100     | 0                        | 0     | 4.5 ± 0.8a,g                        |
| Rennes        | 7              | 79      | 7                        | 7     | 4.3 ± 0.8                           |
| Sofia         | 0              | 18      | 82                       | 0     | 4.5 ± 0.9a,g,h,k                    |
| Szeged        | 0              | 36      | 64                       | 0     | 4.7 ± 0.5a,c,f,g,h,k,n              |
| Toulouse      | 0              | 90      | 5                        | 5     | 4.1 ± 1.1a,h,i,j,m,n,p,q,r          |
| Trieste       | 24             | 64      | 12                       | 12    | 3.6 ± 1.0a,c,f,g,h,k,n,t,u          |
| Turku         | 0              | 19      | 67                       | 14    | 4.8 ± 0.4a,c,f,g,h,k,n,t,u          |
| Ulm           | 0              | 12      | 88                       | 0     | 4.5 ± 0.6a,k,u                      |

Data are expressed as percentage or mean score ± s.d. For explanation of superscripts, see legend of Table 2.

Table 5. Percentage of students from 23 different European dental schools who reported to have received education in specific extraction techniques

| Dental school | Forceps techniques | Elevator techniques | Non-surgical removal of retained roots | Surgical removal of retained roots | Surgical removal of third molars | Surgical removal impacted teeth |
|---------------|--------------------|---------------------|--------------------------------------|-----------------------------------|----------------------------------|---------------------------------|
| Amsterdam     | 82                 | 61                  | 48                                   | 7                                 | 16                              | 0                               |
| Bern          | 70                 | 69                  | 30                                   | 20                                | 20                              | 15                              |
| Bordeaux      | 61                 | 71                  | 54                                   | 71                                | 75                              | 13                              |
| Brest         | 63                 | 75                  | 35                                   | 69                                | 75                              | 13                              |
| Cardiff       | 86                 | 64                  | 5                                    | 14                                | 14                              | 0                               |
| Copenhagen    | 70                 | 90                  | 45                                   | 70                                | 80                              | 40                              |
| Ghent         | 95                 | 90                  | 42                                   | 11                                | 5                               | 5                               |
| Kaunas        | 73                 | 83                  | 27                                   | 14                                | 19                              | 8                               |
| Kosice        | 78                 | 44                  | 44                                   | 6                                 | 6                               | 6                               |
| Leeds         | 100                | 73                  | 41                                   | 36                                | 41                              | 18                              |
| London        | 100                | 97                  | 83                                   | 69                                | 21                              | 17                              |
| Msida         | 100                | 100                 | 20                                   | 10                                | 0                               | 0                               |
| Nantes        | 62                 | 81                  | 52                                   | 67                                | 71                              | 38                              |
| Nijmegen      | 87                 | 87                  | 44                                   | 13                                | 13                              | 13                              |
| Oslo          | 67                 | 76                  | 33                                   | 17                                | 42                              | 17                              |
| Plymouth      | 95                 | 66                  | 55                                   | 65                                | 55                              | 40                              |
| Rennes        | 29                 | 71                  | 43                                   | 50                                | 50                              | 14                              |
| Sofia         | 72                 | 84                  | 34                                   | 36                                | 36                              | 18                              |
| Szeged        | 86                 | 55                  | 68                                   | 64                                | 73                              | 50                              |
| Toulouse      | 42                 | 74                  | 47                                   | 42                                | 42                              | 11                              |
| Trieste       | 96                 | 80                  | 72                                   | 48                                | 28                              | 8                               |
| Turku         | 86                 | 76                  | 47                                   | 24                                | 38                              | 10                              |
| Ulm           | 71                 | 59                  | 24                                   | 24                                | 24                              | 12                              |

Data are expressed as percentages.
of the final assessment. Therefore, during recent years, setting numerical targets has increasingly been replaced in dental school curricula by a competency-based approach, although certain numerical targets are still present in most curricula.

Knowledge of the relevant anatomy is important to perform a tooth extraction correctly. A few dental students in Europe felt insufficiently prepared with regard to anatomical aspects of extractions (Table 7). This is in line with a recent national survey of UK final year dental students, where 78% of the students reported that the anatomy teaching had been appropriate to their clinical needs. The percentage of students who feels insufficiently prepared for potential complications during a tooth extraction in a patient varied in the present study considerable between dental schools, from 0 to 60%. We did not specify different types of potential complications in our questionnaire. In the UK, a high percentage of the final year dental students feel confident to manage haemorrhage. Therefore, it might be interesting to explore in future studies which (other) complications are anticipated by dental students in Europe.

Preclinical training on manikins may assist dental students to develop operative skills, may increase their level of competence and facilitate the transition to the clinic. In the UK, several dental school use preclinical models for the teaching of extraction skills. These models include commercially available models, virtual learning environments, pigs’ heads and a rubber dam stretched over a cup. The present study shows that preclinical models are used at a considerable number of dental schools in Europe. At dental schools where a preclinical training model is widely used, the students considered it a useful preparation for the subsequent tooth extraction in a patient (Table 3). However, at two dental schools only few students found the preclinical training model useful. These differences in appreciation might be related to the type of preclinical model used and/or the amount of time to practice with it. Supervision during the use of the training model, as well as the amount of time between the training with the model and the transition to the clinic may also affect the opinion of the student. Further studies on the effectiveness of different types of preclinical training models for the teaching of extraction skills seem warranted.

Student feedback is an important component to monitor academic programs. Their input gives insight in teaching effectiveness and allows dental schools to identify possible weaknesses in their curriculum, which can result in improvement of clinical teaching. However, in the present study, the current

| Dental school | Properly trained (range 1–5) | Overall rating (range 1–5) |
|---------------|------------------------------|---------------------------|
| Amsterdam     | 2.8 ± 1.2                    | 2.5 ± 1.0                 |
| Bern          | 3.6 ± 0.7a                   | 4.0 ± 0.8a                |
| Bordeaux      | 3.6 ± 0.8                    | 3.8 ± 0.7a                |
| Brest         | 3.6 ± 0.8                    | 4.0 ± 0.8a                |
| Cardiff       | 3.1 ± 1.1c                   | 2.9 ± 1.0h,c,d            |
| Copenhagen    | 4.1 ± 0.7abw                | 4.3 ± 0.7abc,e            |
| Ghent         | 2.7 ± 1.1bcd,ef              | 3.0 ± 0.9bc,df            |
| Kaunas        | 3.1 ± 1.0c                  | 3.6 ± 0.9bc,df            |
| Kosice        | 3.5 ± 1.1                    | 3.7 ± 0.9bc,df            |
| Leeds         | 3.8 ± 0.8ax,qh              | 4.1 ± 0.8ax,qh            |
| London        | 3.9 ± 0.9aq,xh              | 4.0 ± 1.0aq,xh            |
| Msida         | 3.4 ± 0.7                    | 3.7 ± 1.0p                |
| Nantes        | 4.0 ± 0.8ax,qh              | 4.1 ± 0.8ax,qh            |
| Nijmegen      | 3.3 ± 1.0km,x,m              | 3.3 ± 1.0km,x,m           |
| Oslo          | 2.9 ± 1.2                    | 3.0 ± 0.8                 |
| Plymouth      | 4.3 ± 0.8bcdeghijlno        | 4.3 ± 0.8bcdeghijlno      |
| Rennes        | 3.7 ± 0.9g                  | 3.6 ± 0.9g,xq            |
| Sofia         | 4.0 ± 0.7ax,qh,ln           | 4.4 ± 0.6ax,qh,ln         |
| Szeged        | 4.2 ± 0.9ax,qh,ln           | 4.5 ± 0.8ax,qh,ln         |
| Toulouse      | 3.6 ± 1.1g                  | 3.6 ± 0.8ax,qh           |
| Trieste       | 4.1 ± 0.7ax,qh,ln           | 4.1 ± 0.7ax,qh,ln         |
| Turku         | 3.4 ± 1.1ax,qh              | 4.1 ± 1.1ax,qh            |
| Ulm           | 2.2 ± 1.1bcd,efhijklmnpqrstuw | 2.8 ± 1.0bcd,efhijklmnpqrstuw |

Data are expressed as mean scores ± s.d. For explanation of superscripts, see legend of Table 2.

| Dental school | Anatomy | Knowledge of forceps and elevators | Prescription of analgesics | Medication problems | Complications | Legal aspects |
|---------------|---------|------------------------------------|---------------------------|---------------------|---------------|--------------|
| Amsterdam     | 0       | 52                                 | 11                        | 19                  | 44            | 11           |
| Bern          | 0       | 10                                 | 0                         | 0                   | 5             | 0            |
| Bordeaux      | 11      | 25                                 | 18                        | 11                  | 21            | 11           |
| Brest         | 19      | 38                                 | 6                         | 13                  | 31            | 0            |
| Cardiff       | 14      | 55                                 | 36                        | 32                  | 27            | 32           |
| Copenhagen    | 0       | 30                                 | 5                         | 5                   | 25            | 5            |
| Ghent         | 5       | 15                                 | 20                        | 10                  | 30            | 10           |
| Msida         | 10      | 60                                 | 50                        | 40                  | 60            | 20           |
| Nantes        | 0       | 14                                 | 0                         | 5                   | 5             | 1            |
| Nijmegen      | 0       | 25                                 | 4                         | 17                  | 42            | 0            |
| Kaunas        | 12      | 20                                 | 15                        | 17                  | 34            | 5            |
| Kosice        | 22      | 11                                 | 6                         | 21                  | 17            | 6            |
| Leeds         | 13      | 32                                 | 31                        | 5                   | 27            | 0            |
| London        | 7       | 45                                 | 17                        | 10                  | 38            | 28           |
| Oslo          | 25      | 50                                 | 0                         | 8                   | 17            | 0            |
| Plymouth      | 5       | 15                                 | 5                         | 0                   | 15            | 0            |
| Rennes        | 0       | 18                                 | 12                        | 12                  | 12            | 12           |
| Sofia         | 16      | 6                                  | 2                         | 10                  | 20            | 8            |
| Szeged        | 13      | 22                                 | 22                        | 22                  | 17            | 13           |
| Toulouse      | 32      | 42                                 | 16                        | 16                  | 37            | 26           |
| Trieste       | 4       | 8                                  | 4                         | 12                  | 8             | 0            |
| Turku         | 9       | 23                                 | 9                         | 23                  | 23            | 9            |
| Ulm           | 12      | 53                                 | 0                         | 24                  | 41            | 6            |

Data are expressed as percentages.
AADP and oot extraction and surgical educa-

tion. Several students may not have followed the complete study
programme with regard to extractions at their dental school. As
surgical extractions are taught at a later stage, this means that
the expressed opinions of the European dental students will most rely
on their experiences with forceps extractions.

Despite these limitations, this study supports previous studies
which showed that European dental schools vary considerably in
their curriculum.10–13 This variation in teaching programs could
result in different levels of competences of recently graduated
dentists from different dental schools.6 Considering the interna-
tional mobility of the contemporary dentists, a drive towards more
convergence in dental education in Europe seems warranted.21

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COMPETING INTERESTS
The authors declare no conflict of interest.

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