



Pell–Gregory classification is unreliable as a predictor of difficulty in extracting impacted lower third molars

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SUMMARY. We present a study of 166 extractions of impacted lower third molars, all vertical and all extracted by the same surgeon. Each tooth was classified according to the Pell–Gregory scales of position for the occlusal plane (scale A–C) and the ascending ramus of the mandible (scale 1–3). The extraction was subsequently rated as ‘easy’ or ‘difficult’.

Taking Pell–Gregory class C as a predictor of a ‘difficult’ extraction, specificity was 88% but sensitivity was low at 15%. Taking Pell–Gregory class 3 as an indicator of ‘difficult’, sensitivity was somewhat better (50%), but at the expense of specificity (62%). Likelihood ratios for the individual classes also indicated that the scales are of little value for predicting a difficult extraction. © 2000 The British Association of Oral and Maxillofacial Surgeons

INTRODUCTION

The classification by Pell and Gregory¹ is widely used for predicting the difficulty of extracting impacted lower third molars. The classification of such molars is based on their spatial relationships (as shown by radiography) to the ascending ramus of the mandible and to the occlusal plane.^{2,3} In the present study, we investigated the classification’s predictive reliability.

PATIENTS AND METHOD

We studied 166 vertical lower third molars that were part of a consecutive series of 366 lower third molars extracted under local anaesthesia by the same surgeon. All 166 teeth were classified on both the A–C and 1–3 scales of the Pell–Gregory classification of panoramic radiographic findings (Table 1).

After extraction, surgical difficulty was rated on the following scale: I=extraction required forceps only; II=extraction required osteotomy; III=extraction required osteotomy and coronal section; or IV=extraction more complex.

In the subsequent analysis of the data, levels I and II were grouped together as ‘easy’, and levels III and IV as ‘difficult’.

The usefulness of the Pell–Gregory classification for predicting surgical difficulty was evaluated by taking class C as indicator of ‘difficult’, and by taking class 3 as an indicator of ‘difficult’, in both cases by calculating sensitivity (the proportion of difficult-surgery cases that the Pell–Gregory criteria predicted would be ‘difficult’) and specificity (proportion of easy cases that the

Table 1 – The Pell–Gregory classification

- A = The occlusal plane of the impacted tooth is at the same level as the occlusal plane of the second molar.
- B = The occlusal plane of the impacted tooth is between the occlusal plane and the cervical line of the second molar.
- C = The impacted tooth is below the cervical line of the second molar.
- 1 = There is sufficient space between the ramus and the distal part of the second molar for the accommodation of the mesiodistal diameter of the third molar.
- 2 = The space between the second molar and the ramus of the mandible is less than the mesiodistal diameter of the third molar.
- 3 = All or most of the third molar is in the ramus of the mandible.

Pell–Gregory criteria predicted would be ‘easy’). We also calculated the likelihood ratios and associated 95% confidence intervals (CIs) for each class of both of the Pell–Gregory scales.

RESULTS

The full cross classification of subjects by predictor (Pell–Gregory class) and outcome (surgical difficulty class) is shown in Table 2. Cross classifications according to the Pell–Gregory A–C scale only and the Pell–Gregory 1–3 scale only are shown in Table 2.

Using Pell–Gregory class C to indicate ‘difficult’, specificity was 88% but sensitivity was low at 15%. Using Pell–Gregory class 3 to indicate ‘difficult’, sensitivity was somewhat better (50%), but at the expense of specificity (62%).

Likelihood ratios for each class of each scale are also shown in Table 3. These ratios were in all cases close to one, except the ratio for class 1, which was 0.3 (95% CI 0.11–0.96).

Table 2 – Cross classification of the 166 vertical impacted lower third molars by Pell–Gregory class (combined A–C and 1–3 scales) and surgical difficulty class ('easy' = class I; 'difficult' = class IV)

Pell–Gregory	Easy		Difficult		Total
	I	II	III	IV	
A1	25	14	1	2	42
A2	11	11	2	6	30
A3	13	21	3	1	38
B1	1	6	–	–	7
B2	3	6	–	1	10
B3	3	9	3	3	18
C1	–	4	–	–	4
C2	1	5	1	–	7
C3	–	7	2	1	10
Total	57	83	12	14	166

Table 3 – Cross classifications of the 166 vertical impacted lower third molars by Pell–Gregory class (A–C scale, or 1–3 scale) and surgical difficulty class ('easy' = class I or II; 'difficult' = class III or IV)

Pell–Gregory scale	Difficult		Easy		Likelihood ratio
	No.	P1	No.	P2	
A	15	0.58	95	0.68	0.85 (0.60 to 1.20)
B	7	0.59	28	0.20	1.46 (0.74 to 2.89)
C	4	0.15	17	0.12	1.27 (0.46 to 3.47)
Total	26		140		
1	3	0.11	50	0.36	0.32 (0.11 to 0.96)
2	10	0.38	37	0.26	1.46 (0.83 to 2.55)
3	13	0.50	53	0.38	1.32 (0.85 to 2.05)
Total	26		140		

Likelihood ratios (LRs), calculated as P1/P2, are a measure of the degree by which knowledge of that Pell–Gregory class affects the predicted probability of 'difficult': an LR of 1 indicates no effect, an LR of less than 1 indicates reduced probability, and an LR of more than 1 indicates increased probability. Values in brackets are 95% confidence intervals for LRs.

DISCUSSION

The Pell–Gregory classification is widely cited in standard texts on oral and maxillofacial surgery (Alling *et al.*;² Peterson;³ Iizuka *et al.*;⁴ Sortino *et al.*⁵) as a useful set of criteria for predicting difficulty in the extraction of an impacted lower third molar, on the basis of the tooth's spatial relationships (as revealed by radiography) with the ascending ramus of the mandible and with the occlusal plane.³ As far as we are aware, however, no previous studies have looked at the reliability of these criteria. In the present study, we assessed the reliability of the Pell–Gregory classification for predicting surgical difficulty against our own postoperative difficulty scale. We think that our scale is a reliable and consistent measure of surgical difficulty, and can be considered an appropriate 'gold standard'.

The patients included in the present study all had vertical third molars. We excluded from the study patients in whom the molar to be extracted was not vertical, to minimize the number of factors that affect the difficulty of extraction, and because it is difficult to classify non-vertical molars on the Pell–Gregory scales. Of the 366

patients in our original series, 201 (55%) were excluded for this reason. It is therefore important to stress that our results are applicable only to vertical molars. All the teeth were successfully classified on both the predictor and the outcome scales, and the assessment of each was done without knowledge of the other, so that bias in both investigation and expectation can be ruled out.

Our results indicate that prediction of surgical difficulty on the basis of the Pell–Gregory scales (whether taking class C or class 3 as indicator of 'difficult') has low sensitivity; in other words, a high proportion of difficult cases are not detected. A similar calculation of likelihood ratios considering each class of each scale separately (Table 2) indicated that the Pell–Gregory scales are of little value for predicting surgical difficulty: adopting the criteria of Jaeschke *et al.*⁶ (significantly improved prediction is indicated by likelihood ratios lower than 0.5 or greater than 2), only classification as class 1 on the 1–3 scale (LR=0.32) appreciably improves prediction. In practical terms, these results indicate that the operations of class-1 subjects will generally be 'easy'; however, a considerable proportion of the operations of class 2 and class 3 subjects will also be 'easy', and there is no reliable way of predicting whose operations will be 'difficult'.

We conclude that the Pell–Gregory classification is not a reliable predictor of surgical difficulty in the extraction of vertical impacted lower third molars. Our findings, and the fact that more than half (55%) of the patients who consulted us had non-vertical molars (which are difficult to classify on the Pell–Gregory scales), suggest that this classification is of little value in clinical practice.

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