

**IN THE DISTRICT COURT
AT WELLINGTON**

**I TE KŌTI-Ā-ROHE
KI TE WHANGANUI-A-TARA**

[2022] NZACC 85

ACR 64/21

UNDER	THE ACCIDENT COMPENSATION ACT 2001
IN THE MATTER OF	AN APPEAL UNDER SECTION 149 OF THE ACT
BETWEEN	MATTHEW FOLKEMA Appellant
AND	ACCIDENT COMPENSATION CORPORATION Respondent

Hearing by AVL: 7 March 2022

Evidence
Completed 7 April 2022

Appearances: B Hinchcliff for the appellant
F Becroft and L Hawes-Gandar for the respondent

Judgment: 10 May 2022

**RESERVED JUDGMENT OF JUDGE D L HENARE
[Treatment Injury s 32 Accident Compensation Act 2001]**

[1] The appellant, Matthew Folkema challenges the Corporation's decision declining his claim for cover for upper incisor root resorption (root resorption) as a treatment injury. Root resorption is a process in which the body breaks down and absorbs the tissue surrounding a tooth that connects the tooth to the gum. It can lead to teeth falling out or becoming loose.

[2] The treatment injury claim was lodged in June 2019 by Mr Folkema's GP who recorded the circumstances of treatment which commenced in Peru and continued in New Zealand, causing injury:

Braces placed for overbite, in Peru 2015. Maintained in NZ and removed late 2017/early 2018.

[3] Mr Folkema informed the Corporation in July 2019 he considered that root resorption had been caused by the treatment provided by Dr Quick, Orthodontist.

[4] A treatment injury report attached to the revised decline decision of the Corporation dated 9 November 2020, indicated while Mr Folkema suffered root resorption caused by orthodontic treatment, the injury was an ordinary consequence of that treatment. The report set out the Corporation's assessment of the relevant clinical information:

ACC assessed your relevant clinical information

ACC finds that an 'expectation' that root resorption would be more likely to be more extensive (in your particular case) when the broad likelihood is already very high for orthodontic treatment, with you having increased risk factors on top of the broad likelihood, indicates that this outcome was not a surprise, that it would be considered an ordinary consequence of the treatment provided in this your specific circumstances.

After assessment of the clinical information currently available to ACC we concluded that there was no failure in the provision of your orthodontic care for the management of your braces. Although root resorption of your upper incisors resulted from your treatment, it is considered that this is an ordinary (likely) consequence of treatment in your case.

The criteria for a treatment injury have not been met; accordingly your claim is declined for cover.

[5] The key issue in the appeal is whether root resorption is an ordinary consequence of the orthodontic treatment Mr Folkema received.

Agreed facts

[6] In late 2015/early 2016 Mr Folkema had braces fixed to his upper and lower jaws in Peru.

[7] On 13 February 2016, Mr Folkema received orthodontic treatment from Dr Quick, Orthodontist.

[8] Panoramic x-rays taken in November 2017 identified some root resorption of the upper incisors.

[9] On 3 December 2017, Dr Quick wrote to Mr Folkema regarding the tooth resorption issue. He recorded that based on a rough comparison between the x-rays the appellant's upper right central root length had reduced from an initial 14 mm to 10 mm.

[10] Further x-rays were taken in June 2019, which showed that there had been some further root resorption of the upper incisors.

[11] On 25 June 2019, Mr Folkema's GP lodged a claim for upper incisor root resorption said to have been caused by treatment provided by Dr Quick.

[12] On 7 August 2019, Dr Quick stated in part:

Root resorption is a very common side defect of orthodontic treatment ... On average the amount of root resorption is in the region of 1.5mm and it is very rare to have reabsorption greater than 4mm.

[13] On 14 November 2019, the Corporation declined cover on the basis that root resorption was an ordinary consequence of orthodontic treatment.

[14] On 27 July 2020 Mr Lawless, Reviewer, quashed the Corporation's decision declining cover and directed it to obtain further evidence in relation to whether the degree of root resorption experienced by Mr Folkema was an ordinary consequence of treatment and then issue a further decision.

[15] After obtaining further evidence, the Corporation issued a further decision on 9 November 2020, again declining cover on the basis that the degree of root resorption experienced by Mr Folkema was an ordinary consequence of treatment.

[16] The Corporation's decision was upheld by Mr Edmundson, Reviewer, in a decision dated 1 April 2021. The current appeal arises from this review decision.

Orthodontic history

[17] Mr Folkema has an orthodontic history dating back to his teenage years.

[18] On 31 July 2019, Dr Sommerville, Orthodontist reported on Mr Folkema's history of braces and upper first premolar extraction provided by Dr Dearing, Orthodontist. In Mr Folkema's teenage years, Dr Dearing had suggested a combination of treatment. First, orthodontic treatment which was not completed. Secondly, orthognathic surgery which was declined. At university, Mr Folkema's second premolar tooth was extracted.

[19] In late 2015, when travelling in Peru, Mr Folkema consulted an orthodontist for urgent treatment. He was diagnosed with a 'severe class II division 1 malocclusion with severely increased overjet and palatally impinging overbite, retruded dentition, very prominent chin, and a very low anterior face height.' Mr Folkema was informed he would lose his front teeth if he did not have treatment immediately. Accordingly, he had braces fitted. Again, the treatment notes show the orthodontist suggested orthognathic surgery.

[20] When Mr Folkema returned to New Zealand, he consulted Dr Quick, Orthodontist. On 13 February 2016, Dr Quick noted the treatment started in Peru and wrote:

The main issue concerning the bite were wear and trauma to the top teeth and gums from the lower teeth, increased overjet and deep bite.

(Emphasis added)

[21] In the same report, Dr Quick also noted the treatment objectives and treatment plan:

Treatment Objectives

The aims of treatment are to continue with treatment in order to reduce the overjet, close the upper spaces (although leave one premolar space on the upper right), improve the deep bite, level and align the teeth and achieve the optimum bite.

Treatment

Levelling and aligning will continue, following which overjet reduction and space closure will commence. Thereafter, a re-assessment will be done to establish the need for jaw surgery, or whether a genioplasty on its own will suffice.

Treatment is expected to take approximately 24 months, depending on compliance and tissue response. Good compliance and oral hygiene can speed up treatment, whilst breakages, poor oral hygiene and compliance can slow treatment down.

(Emphasis added)

[22] Mr Folkema was informed he should seek treatment for chronic periodontal disease. In June 2016, he was referred to periodontic specialist, Dr Danesh-Meyer, who diagnosed gingivitis and recommended therapy to remove plaque and tartar.

[23] After the removal of the braces on 9 April 2018, Dr Quick saw Mr Folkema again in June 2019, and arranged further x-rays. He reported:

... the new panoramic x-ray indicates horizontal bone loss on the upper anterior teeth, **which in conjunction with root resorption (which appears to have progressed despite termination of treatment) will place the longevity of his upper teeth at risk.**

(Emphasis added)

[24] Mr Folkema saw Dr Somerville for a second orthodontic opinion in July 2019. Dr Somerville reviewed radiographs forwarded from Peru and noted Mr Folkema was concerned about root length shortening of his upper anteriors and noted this was likely due to several factors including the nature of the treatment and his underlying skeletal structure. Dr Somerville reported:

The Panex taken revealed shortened root form of his upper incisors, space available (4mm) upper right premolar region, retained lower left deciduous molar, impacted lower third molars.

Matthew is concerned regarding the root shortening of his upper anteriors. I advised this is likely related to several factors:

- **The orthodontic tooth movement, as the teeth were extremely forward and proclined and were uprighted over a considerable distance.**
- **His skeletal pattern (extremely low mandibular plane angle and broad facial type) would be related to extremely heavy vertical forces on his anterior occlusion and possibly contribute to the traumatic forces on these teeth.**

(Emphasis added)

[25] Dr Somerville advised surgery would be required to correct Mr Folkema's orthodontic issues beyond what had already been achieved.

[26] Dr Quick reported on 7 August 2019. He was asked to comment on the cause of the root resorption. By reference to the medical literature, Dr Quick stated:

Root resorption is a very common side effect of orthodontic treatment (1, 3, 18, 16), and in some reports, is present in most individuals undergoing orthodontic treatment (12, 14). Lund et al have reported that approximately 90% of teeth are affected to some degree (14). Root resorption is multifactorial in origin (17, 2), and there are often conflicting reports in the literature, indicating a lack of consensus (7). **The degree of root resorption encountered during orthodontic treatment is fortunately mild, and is considered an acceptable risk of treatment. On average the amount of root resorption is in the region of 1.5 mm (13, 5), and it is very rare to have resorption greater than 4 mm (14). Root resorption is considered severe when the degree of root loss is greater than 30% of the root length (7) ...**

(Emphasis added)

[27] In response to the question of the likelihood of root resorption occurring as a result of treatment, Dr Quick commented:

...root resorption appears to be present in nearly all patients undergoing orthodontic treatment to a lesser or greater degree, so the causality of root resorption with orthodontic treatment is strong. However, root resorption also occurs in individuals who have not had treatment. **In this instance, root resorption is likely correlated to the orthodontic treatment, and the risk for resorption increases with duration, extraction sites and distance that teeth move.** Matthew started orthodontic treatment with Dr Sax Dearing in the Hawkes Bay, but treatment was not completed. Further orthodontic treatment was started in Peru before arriving at our practice. The total duration time in orthodontic treatment is thus unknown, but would be collectively greater than the 26 months that he was with our practice. As Matthew had been in treatment for approximately a month before seeing us, treatment of an extraction adult within 26 months is considered within the normal range.

Matthew also has an extremely complex bite, with very deep overbite that was causing ulceration of his upper incisor teeth. There is the possibility that the traumatically deep bite was also contributing to the root resorption that has occurred, and the fact that the degree of root resorption appeared to continue after treatment had ceased would suggest that such a factor may have contributed.

(Emphasis added)

[28] Dr Quick discussed the factors known to contribute to root resorption for Mr Folkema and concluded:

... Matthew ultimately met several risk factor criteria for resorption — namely extended duration of the treatment (adding the treatment duration with us and the unknown treatment duration of Dr Sax Dearing), large distance of tooth movement and extraction spaces to close. There may be other factors contributing to the occurrence of root resorption, such as his traumatic bite.

[29] The Corporation then sought independent comment from Dr Gilbert, who reported on 29 October 2019. Dr Gilbert opined the treatment provided by Dr Quick had been reasonable and appropriate in the circumstances, noting that:

Regular appointments were made over the following 26 months, with the treatment provided by Dr Quick beginning with a standard approach to level and align the arches using light forces. In September 2016, Matthew reported that he had medical issues and that he could not work. A panoramic x-ray was taken which appeared to show no root resorption. Treatment continued with deterioration in Michael's oral hygiene, and with some difficulty in reducing the overbite. A further panoramic x-ray was taken in November 2017 which appeared to show some root resorption of the upper incisors and Michael was advised of this in a letter dated 3 December 2017. The letter was full and very informative and gave the options from this point. On 16 January 2018 after discussing the contents of the letter, the decision was made to continue treatment. In April 2018 the appliances were removed and retainers fitted.

...

It is very unusual for a patient to commence treatment with one Orthodontist and then leave after one month. Most orthodontists would decide not to start any treatment if they knew this was the case, and to let the second orthodontist to formulate his own treatment plan.

Matthew presented to Dr Quick with an extremely severe malocclusion that was going to be very difficult to treat, and to achieve an optimal occlusion and appearance without maxillofacial surgery which Matthew was reluctant to undergo. He had also discontinued his first course of orthodontic treatment as a teenager, when it would have been a more appropriate time for treatment. He appears to have been a reluctant patient, and perhaps not accepted the extreme severity of his malocclusion and the necessity of treatment for functional reasons. The actual treatment was also compromised by Matthew's health and social issues, and his poor oral hygiene.

[30] Whether a different diagnosis or a different treatment path was indicated by presentation, Dr Gilbert stated:

No. The treatment to be provided was always going to be a compromise due to Matthew's unwillingness to accept orthognathic surgery as an integral part of the treatment. If the jaws could have been surgically repositioned and the actual orthodontic treatment to be undertaken would have been significantly different to that which would be necessary without such surgery. The tooth movement required without surgery, especially the distance and type of movement of the upper incisors, is much more difficult, and it is likely there would be a greater

chance of increased root resorption. Reduction of the extreme severely increased impinging overbite is also much more difficult without surgery.

[31] Dr Gilbert provided comment about root resorption including measuring the amount of root resorption:

Root resorption occurs in almost all orthodontic treatment [1], is multifactorial [2] and there is evidence to suggest a genetic predisposition in some individuals [2, 3]. The degree of root resorption is generally mild in most treatments [4] and considered an acceptable risk of treatment. Heavy force levels increase the risk [5], and the distance and type of root movement of the upper incisors, particularly where the alveolus is narrow and the incisor roots will be in close proximity to the cortical plates [6, 7] as in this case. Matthew also had a very low anterior face height in which his occlusal force would be much increased and possibly causing a traumatic occlusion. This would increase the likelihood of root resorption and the difficulty in correcting the extreme overbite.

Secondly, and importantly, it is difficult to measure the amount of root resorption on a panoramic x-ray, and the lengths of roots cannot be compared between different panoramic x-rays, even if they have been taken with the same machine. Normal anatomic formations can be seen as radio-opaque or radiolucent shadows, and as a result of superimposition there can be a decrease in diagnostic quality. The roots of teeth must be absolutely positioned along the focal spot of the x-ray source. This is not possible with a panoramic x-ray.

[32] Dr Gilbert reported on 30 October 2020 following the Reviewer's decision and direction on 27 July 2020. Mr Gilbert responded to specific questions as follows:

1. CAN I ADVISE THE EXTENT OF THE ROOT RESORPTION.

No.

The panoramic radiographs provided over the total course of treatment and review, have not been taken on the same x-ray machine. The type of machine referred to by Mr Hinchcliff, could only give a measure of the root lengths at the time of exposure. There could therefore be no reference to previous exposures.

2. WHAT IS THE EXTENT OF ROOT RESORPTION NORMALLY EXPECTED FROM PROCEDURES SUCH AS THAT UNDERGONE BY MR FOLKEMA.

The fact that every orthodontist, either involved in the treatment of Mr Folkema, or having reviewed his case, has stated that a successful treatment outcome would have needed to involve maxillo-facial surgery, such surgery lessening the need for such extensive tooth movement [and therefore greater risk of root resorption], indicates that the treatment outcome is likely to be sub-optimal.

Such caution by orthodontist would take into account the greater risk of root resorption due to the prolonged treatment time and the extent and type of the tooth movements required.

The majority of orthodontists would have been most likely to decline starting any treatment without the commitment of Mr Folkema to orthognathic surgery. There would be an expectation that root resorption would be more likely to be more extensive.

3. WAS THE EXTENT OF ROOT RESORPTION ACTUALLY EXPERIENCED BY MR FOLKEMA WITHIN THE NORMAL RANGE OF OUTCOMES FOR SOMEONE UNDERGOING SUCH A PROCEDURE OR WAS IT SUCH TO OCCASION SURPRISE, HAVING REGARD TO a] MR FOLKEMA'S UNDERLYING HEALTH CONDITION AT THE TIME OF THE TREATMENT; AND b] THE CLINICAL KNOWLEDGE AT THE TIME OF TREATMENT.

Mr Folkema's presenting malocclusion was most unusual, and unlikely to have been seen sufficiently often for there to be a normal range of outcomes.

The underlying health conditions were unlikely to have been a factor, but the clinical knowledge at the time of treatment indicated that any treatment would need to involve orthognathic surgery, with the involvement of the maxilla-facial surgeon prior to the commencement of any orthodontic treatment.

Post hearing

[33] The Court received certain articles attached to the report of Dr Gilbert dated 29 October 2019 as follows:

[a] Belinda Weltman and others “Root resorption associated with orthodontic tooth movement: A systematic review”;¹

[b] Vahid Rakhshan “Risk factors associated with external apical root resorption of the maxillary incisors: a 15-year retrospective study”;²

[c] HA Leach, AJ Ireland and EJ Whaites “Radiographic diagnosis of root resorption in relation to orthodontics”;³

[d] Naphtali Brezniak and Atalia Wasserstein “Orthodontically Induced Inflammatory Root Resorption. Part I: The Basic Science Aspects”.⁴

¹ Belinda Weltman and others “Root resorption associated with orthodontic tooth movement: A systematic review” (2010) 137 American Journal of Orthodontics and Dentofacial Orthopedics 462.

² Vahid Rakhshan, Nazanin Nateghian and Morteza Ordoubazari “Risk factors associated with external apical root resorption of the maxillary incisors: a 15-year retrospective study” (2012) 28 Australian Orthodontic Journal 51.

³ HA Leach, AJ Ireland and EJ Whaites “Radiographic diagnosis of root resorption in relation to orthodontics” (2001) 190 British Dental Journal 16.

Agreed issue

[34] There is no dispute that for the purposes of s 32, Mr Folkema's root resorption was caused by orthodontic treatment. The key issue is whether the Corporation was correct to determine that the root resorption experienced by Mr Folkema was an ordinary or necessary consequence of the treatment he received.

Appellant's submissions

[35] Mr Hinchcliff submitted:

- [a] Mr Folkema was under treatment at the time of his injury;
- [b] Mr Folkema was only 31 years old at the time of the injury; and
- [c] Having root resorption causing increased teeth mobility and a guarded prognosis for the upper incisors is not an ordinary or necessary consequence of orthodontic treatment.

[36] Mr Hinchcliff submitted that while it is accepted some root resorption is expected from orthodontic treatment, the extent of root resorption greater than 4 mm experienced by Mr Folkema is "very rare" and indicates the amount of resorption is not a necessary or ordinary consequence of the treatment.

[37] Mr Hinchcliff submitted, after 21 months of treatment, the orthodontist was aware of the risk of root resorption, observed root resorption, recommended further radiographic evaluation from a dentist, but then continued to provide treatment leading to the injury. In Mr Hinchcliff's submission, Dr Quick should have suspended treatment from the date on which he first identified resorption, and he failed to do so.

[38] Mr Hinchcliff submitted the Corporation failed to follow the directions from the first review in relation to obtaining further evidence regarding the extent of resorption which occurred, because the Corporation should have arranged for a

⁴ Naphtali Brezniak and Atalia Wasserstein "Orthodontically Induced Inflammatory Root Resorption. Part I: The Basic Science Aspects" (2002) 72 Angle Orthodontist 175.

dentist to provide “radiographs to determine the amount of root resorption, as stated by Dr Quick on 3 December 2017”.

Respondent’s submissions

[39] Counsel for the Corporation submitted that Mr Folkema’s resorption is an ordinary consequence of his treatment because:

- [a] A certain degree of resorption is an ordinary consequence of orthodontic treatment;
- [b] Mr Folkema’s unusual circumstances put him at a greater risk of resorption than normal and as a result there was no normal range of resorption for him;
- [c] It is not possible to determine the actual degree of resorption which occurred, but even if it were the amount suggested by the appellant, this would be within the normal range of resorption for persons receiving orthodontic treatment generally.

Legal framework

[40] In order to establish cover for a treatment injury, Mr Folkema must meet the requirements of s 32(1) of the Accident Compensation Act 2001 (“the Act”) which relevantly provides:

32 Treatment injury

(1) Treatment injury means personal injury that is—

(a) suffered by a person—

...

(ii) receiving treatment from, or at the direction of, 1 or more registered health professionals; ...

... and

(b) caused by treatment; and

(c) not a necessary part, or ordinary consequence, of the treatment, taking into account all the circumstances of the treatment, including—

- (i) the person's underlying health condition at the time of the treatment; and
- (ii) the clinical knowledge at the time of the treatment.

[41] The primary issue in this case is whether the root resorption is an ordinary consequence of the treatment.

[42] The leading case concerning the meaning "ordinary consequence" is the decision of the Court of Appeal in *Ng*.⁵

[43] The High Court had earlier determined that an ordinary consequence was something that was more probable than not – a consequence that has a 50 per cent or greater chance of occurring.⁶ The Court of Appeal rejected this interpretation, and stated:⁷

[67] What then is the correct interpretation of "not an ordinary consequence?"

[68] In our view, it should be interpreted as meaning an outcome that is outside of the normal range of outcomes, something out of the ordinary which occasions a measure of surprise. That is an interpretation that we consider, as did the Court in *Childs v Hillock*, best captures Parliament's intent in the context of a scheme which is underpinned by the concept of "personal injury by accident" and which does not provide universal compensation for sickness or ill-health. So, for example, side effects of chemotherapy of a nature and severity that are encountered reasonably often and occasion no surprise are ordinary consequences of that chemotherapy even if (as will often be the case) such side effects are not encountered in more than 50 per cent of cases.

[69] Whether an adverse consequence is inside or outside the normal range of consequences of the medical treatment given to a particular claimant is ultimately a matter of judgment for the decision maker. It is to be exercised on a case-specific basis taking into account all the circumstances of the treatment and the particular claimant. Thus, relevant circumstances will include not only the nature of the harm suffered but also its duration and severity as well as any other circumstances pertaining to the patient which may have rendered them more or less susceptible to the adverse consequence. The decision may be informed by medical studies including relevant statistical analysis (subject to the reservations detailed below) as well as the clinical experience of the treating physician physicians(s) and other specialists.

[70] As raised with counsel during the hearing, we consider that some caution is required when drawing on statistical analysis contained in medical studies of the kind referred to in the decisions below, and in the expert evidence before us. Many of these studies involve small numbers of cases, and often the results are not accompanied by any measure of their statistical significance. There may

⁵ *Accident Compensation Corporation v Ng* [2020] NZCA 274, [2020] 2 NZLR 683.

⁶ *Accident Compensation Corporation v Ng* [2018] NZHC 2848.

⁷ *Accident Compensation Corporation v Ng*, above n 1, at [67]–[72].

also be significant differences between the group studied – patients in a particular hospital or on a specialised programme for example – and the group of recipients of similar treatment(s) in New Zealand. The way in which the treatment group is defined, and the way in which adverse outcomes are defined, will often involve significant judgment. These factors underscore the problematic nature of a test based on statistical frequency alone, including the 2001 test of rarity and the Judge’s professional test, focused on whether the adverse consequence is more probable than not. The 2005 amendment deliberately moved away from a statistical assessment of risk to a test that requires the exercise of judgment.

[71] We acknowledge the temporal distinction between risk and consequence as highlighted by Ms Peck. Although risk assessments undertaken by doctors are based on the frequency of past actual occurrences and therefore are clearly relevant, we agree the focus should be on whether the outcome that occurred is within the range of ordinary consequences rather than whether the risk of the outcome was predicted in advance of treatment in a particular claimant’s case.

[72] We also acknowledge that our interpretation does not provide the precision or comprehensive guidance that counsel, especially Ms Peck, were seeking. However, Parliament has chosen to use an imprecise test and in our view the Court would be straying beyond its proper function to disregard that and superimpose a structure of its own creation. As noted by this Court in *Vodafone New Zealand v Telecom New Zealand*, the Court must guard against “taking an inherently imprecise word and ‘by redefining it thrusting on it a spurious degree of precision’”. If the lack of precision in s 32 is problematic, it is for the legislature to resolve.

[44] While this decision sets out some principles for guidance, the Court of Appeal explicitly states in this extract that their approach does not provide the precision or comprehensive guidance.⁸ Further, the Court of Appeal considered that the language of s 32 of the Act indicated a move away from statistical frequency alone to tests that have a degree of flexibility and permit the decision maker to exercise judgment.⁹ This is a positive approach because treatment injury claims show an extraordinarily wide variety of circumstances from which these cases arise, and this fact alone indicates the difficulty of attempting an exhaustive definition. When weighing medical evidence, there are many variables.

[45] Additionally, I note that the Court’s decision is clear that the assessment of whether something is “surprising” is “ultimately a matter of judgment for the decision maker”.¹⁰ Therefore, neither evidence of whether a patient was surprised by an adverse consequence nor evidence that a medical professional was not surprised

⁸ At [72].

⁹ At [69].

¹⁰ At [69].

by an adverse consequence is determinative. These perspectives can only inform the decision maker when considering the facts from an objective perspective.

[46] If a patient's perspective is determinative, no adverse outcome would be an ordinary consequence because patients often consider complications to be rare and that they will not happen to them. Similarly, if an expert's perspective is determinative, most adverse consequences would be ordinary consequences because very few adverse outcomes will be a surprise.

[47] I note the manner in which the Court of Appeal interpreted the meaning of "not an ordinary consequence".¹¹ The Court held the phrase means: "an outcome that is outside the normal range of outcomes, something out of the ordinary which occasions a measure or surprise".¹²

[48] The Court of Appeal held that when applying this test, the decision maker must exercise judgment on a case specific basis taking into account all relevant circumstances about the treatment and the particular claimant. The relevant circumstances outlined by the Court that should be taken into account by the decision maker include:

[a] The nature, duration and severity of the harm suffered.¹³

[b] Circumstances relating to the patient which may have made them more susceptible to the adverse consequence.¹⁴

[c] Medical or otherwise specialist studies or literature, including statistical analysis, but subject to the following reservations:¹⁵

[i] Statistics should be read with caution. Care should be taken to ensure that studies are relevant. Studies are also sometimes statistically insignificant.¹⁶

¹¹ The Court of Appeal explicitly rejected the precise tests proposed by counsel at [54]–[60].

¹² At [67]–[68].

¹³ At [69].

¹⁴ At [69].

¹⁵ At [69].

[ii] Statistical analysis is only one of the relevant factors. It is not determinative.¹⁷

[d] Clinical experience of the treating specialists but subject to the reservation that the focus is not whether the adverse outcome was predicted in advance.¹⁸

[49] Finally, alongside these relevant circumstances, the Court of Appeal has outlined three circumstances where it considers an outcome is or is not an ordinary consequence. The first example is from *Ng*, and the other two outcomes are outlined in the Court's judgment in *Adlam v Accident Compensation Corporation*.¹⁹ Although the Court's relevant statements in *Adlam* were subsequently treated as obiter in *Ng*,²⁰ the examples outlined in *Adlam* are still instructive. The example from *Ng* is as follows:²¹

... side effects of chemotherapy of a nature and severity that are encountered reasonably often and occasion no surprise are ordinary consequences of that chemotherapy even if (as will often be the case) such side effects are not encountered in more than 50 per cent of cases.

[50] The two examples from *Adlam* are:²²

[42] ... That then leads to the question of whether the injury suffered was not a necessary part or ordinary consequence of the treatment, taking into account the matters referred to in ss 32(c)(i) and (ii). That is a question of fact.

[43] Suppose a drug is administered which, as a result of an unanticipated allergic reaction causes injury. It is clear that there has been treatment injury. The injury was plainly not the ordinary consequence of the treatment, which would never have been administered had the consequence been anticipated.

[44] Next, take the case of a nerve cut during surgery, the nerve being in an unanticipated position. That will be covered because there could be no argument that the cutting of the nerve was an ordinary consequence of the surgical procedure undertaken.

¹⁶ At [70].

¹⁷ At [70].

¹⁸ At [69] and [71].

¹⁹ *Adlam v Accident Compensation Corporation* [2017] NZCA 457, [2018] 2 NZLR 102.

²⁰ *Accident Compensation Corporation v Ng*, above n 5, at [21].

²¹ At [68].

²² *Adlam v Accident Compensation Corporation*, above n 16, at [42]–[45].

[45] In both these kinds of case the factual issue raised by s 32(1)(c) can easily be answered. There is no doubt what has occurred is not a necessary part of the treatment. In other cases the issue may not be so easily determined.

[51] I now turn to consider whether Mr Folkema's root resorption is an ordinary consequence of the orthodontic treatment he received.

Discussion

[52] In assessing whether Mr Folkema's root resorption is an ordinary consequence of his orthodontic treatment, it is firstly necessary to consider the nature, duration and severity of his condition.

[53] Root resorption is the process in which the body breaks down and absorbs the tissue surrounding a tooth that connects the tooth to the gum. It can lead to teeth falling out or becoming loose. The evidence indicates that Mr Folkema has suffered root resorption; however, the evidence is less clear as to how much root resorption he suffered.

[54] In his report dated 3 December 2017, Dr Quick compared x-rays of Mr Folkema's teeth taken in 2016 and 2017. He noted a reduction from 13mm to 12mm in the upper left central incisors, this being a reduction of 1mm or just under 8%. He also noted a reduction from 14mm to 10mm in the upper right central incisors, this being a reduction of 4mm or just over 28%. However, Dr Quick went on to recognise that his measurements might not be accurate:

Please note that there are a number of sources of error between the x-rays, which include:

- Different angulations of the head due to positioning;
- Difference in focal trough of the x-ray machine;
- Change in tooth angulation;
- Change in bone height; and
- Other factors.

Recognising that the measurements are fairly crude, it would indicate that there has been root resorption of the upper central incisor teeth that has increased the relative ratio of crown to root by approximately 0.3. This is a significant change, and there are a number of possible treatment approaches.

[55] In his report of 29 October 2019, Dr Gilbert echoed Dr Quick's statements about the difficulty of measuring root resorption:

... it is difficult to measure the amount of root resorption on a panoramic x-ray, and the lengths of roots cannot be compared between different panoramic x-rays, even if they have been taken with the same machine. Normal anatomic formations can be seen as radio-opaque or radiolucent shadows, and as a result of superimposition there can be a decrease in diagnostic quality. The roots of teeth must be absolutely positioned along the focal spot of the x-ray source. This is not possible with a panoramic x-ray. The reliability of any results is therefore doubtful when considering the magnification of two dimensional radiographs [8]. It is obvious when comparing the 4 panoramic radiographs that the teeth are not positioned in the same place for any of the x-rays. Therefore the roots may well have been shorter, or dilacerated, in the initial records. Only a CBCT [Cone Beam Computerised Tomogram] scan will give an exact measurement of the root lengths and bone height. CBCT scans are expensive and not routinely used.

[56] In his report of 30 October 2020, Dr Gilbert similarly stated:

CAN I ADVISE THE EXTENT OF THE ROOT RESORPTION?

No.

The panoramic radiographs provided over the total course of the treatment and receive, have not have been taken on the same x-ray machine. The type of machine referred to by Mr Hinchliff, could only give a measure of the root lengths at the time of exposure. There could therefore be no reference to previous exposures.

[57] Taken together, Dr Quick and Dr Gilbert's reports do not indicate with any certainty the extent of Mr Folkema's root resorption. In particular, it is not clear how much his roots have resorbed or when this occurred. It follows, the Court does not accept Mr Hinchliff's submission that the root resorption was likely greater than 4mm. However, it is accepted that some root resorption occurred, as indicated by Dr Quick's report of 3 December 2017.

[58] Having considered the extent of Mr Folkema's root resorption, I turn to consider the medical evidence relating to root resorption. The literature referred to by Dr Quick and Dr Gilbert indicates that root resorption is an unavoidable pathological consequence of orthodontic tooth movement. Brezniak and Wasserstein write:²³

²³ Brezniak and Wasserstein, above n 4, at 175.

Orthodontically induced inflammatory root resorption or, as it is better known, root resorption, is an unavoidable pathological consequence of orthodontic tooth movement.

[59] Dr Quick also outlined in his report of 7 August 2019:

Root resorption is a very common side effect of orthodontic treatment (1, 3, 18, 16), and in some reports, is present in most individuals undergoing orthodontic treatment (12, 14). Lund et al have reported that approximately 90% of teeth are affected to some degree (14). Root resorption is multifactorial in origin (17, 2), and there are often conflicting reports in the literature, indicating a lack of consensus (7). The degree of root resorption encountered during orthodontic treatment is fortunately mild, and is considered an acceptable risk of treatment. On average the amount of root resorption is in the region of 1.5mm (13, 5), and it is very rare to have resorption greater than 4 mm (14). Root resorption is considered severe when the degree of root loss is greater than 30% of the root length (7). Some factors have been shown to be associated with root resorption, including the use of high forces during treatment (18, 17, 9), and physical distance of root apex movement, particularly of the upper incisor teeth (8, 10, 4). The extraction of teeth for treatment has also been found to increase the risk of root resorption (13, 11, 8, 6), as root morphology, particularly thin and pipette shaped roots (5), although Weltman et al (18) found that root morphology did not play a role. Pre-existing root shortening and pre-existing root resorption has also been shown to be a risk factor for further resorption during treatment (11). Root resorption has been shown to be more frequent in females compared to males (13), although this was not found in other studies (10, 5). Orthognathic surgery was not found to be a risk factor for root resorption.

An enduring risk factor common to many of the review articles was duration of treatment (13, 10, 9, 8, 6, 4), and given the somewhat extended duration of the client's treatment (taking combined treatment with us and previous treatment), this may possibly have contributed to the resorption seen. However, root resorption is unpredictable (3), and cannot be prevented with any degree of certainty (2).

[60] Based on Dr Quick's report and the analysis of Brezniak and Wasserstein, I conclude that the ordinary range of consequences for orthodontic treatment includes some measure of root resorption. However, Dr Quick's analysis about the relative probabilities of differing amounts of root resorption occurring is somewhat unhelpful because of the uncertainty surrounding how much root resorption did in fact occur in this case.

[61] Having determined that the ordinary range of consequences for orthodontic treatment includes some measure of root resorption, I turn to consider Mr Folkema's susceptibility to root resorption in light of the medical literature.

[62] In his report of 7 August 2019, Dr Quick commented:

In this instance, root resorption is likely correlated to the orthodontic treatment, and the risk for resorption increases with duration, extraction sites and distance that teeth move. Matthew started orthodontic treatment with Dr Sax Dearing in the Hawkes Bay, but treatment was not completed. Further orthodontic treatment was started in Peru before arriving at our practice. The total duration time in orthodontic treatment is thus unknown, but would be collectively greater than the 26 months that he was with our practice. ...

Matthew also has an extremely complex bite, with very deep overbite that was causing ulceration of his upper incisor teeth. There is the possibility that the traumatically deep bite was also contributing to the root resorption that has occurred, and the fact that the degree of root resorption appeared to continue after treatment had ceased would suggest that such a factor may have contributed.

...

Matthew ultimately met several risk criteria for resorption – namely extended duration of treatment (adding the treatment duration with us and the unknown treatment duration with Dr Sax Dearing), large distance of tooth movement and extraction spaces to close. There may be other factors contributing to the occurrence of root resorption, such as his traumatic bite.

[63] Dr Gilbert made similar remarks in his report of 29 October 2019:

Root resorption occurs in almost all orthodontic treatment [1], is multi-factorial [2] and there is evidence to suggest a genetic pre-disposition in some individuals [2,3]. The degree of root resorption is generally mild in most treatments [4] and considered an acceptable risk of treatment. Heavy force levels increase the risk [5], and the distance and type of root movement of the upper incisors, particularly where the alveolus is narrow and the incisor roots will be in close proximity to the cortical plates [6,7] as in this case. Matthew also had a very low anterior face height in which his occlusal force would be much increased and possibly causing a traumatic occlusion. This would increase the likelihood of root resorption and the difficulty in correcting the extreme overbite.

[64] Dr Gilbert made further remarks in his subsequent report of 30 October 2020:

The fact that every orthodontist, either involved in the treatment of Mr Folkema, or having reviewed his case, has stated that a successful treatment outcome would have needed to involve maxilla-facial surgery, such surgery lessening the need for such extensive tooth movement [and therefore greater risk of root resorption], indicates that the treatment outcome is likely to be sub-optimal.

Such caution by orthodontist would take into account the greater risk of root resorption due to the prolonged treatment time and the extent and type of tooth movements required.

The majority of orthodontists would have been most likely to decline starting any treatment without the commitment of Mr Folkema to orthognathic surgery. There would be an expectation that root resorption would be more likely to be more extensive.

[65] In one of the papers cited by Dr Gilbert, the authors, Rakhshan, Nateghian and Ordoubazari, indicated that root resorption is associated with premolar extractions.²⁴ Dr Quick reported on 13 February 2016 that Mr Folkema was missing his upper first premolar teeth and also his upper right second premolar tooth.

[66] Additionally, I note that the upper and lower incisors (maxillary and mandibular incisors) tend to be more susceptible to root resorption.²⁵ I consider it significant that Mr Folkema's treatment was focused on his upper and lower incisors, and the root resorption which occurred is said to have affected his upper incisors.

[67] Based on the evidence of Dr Quick and Dr Gilbert, together with the orthodontic literature cited to support their views, I conclude that Mr Folkema had increased susceptibility to root resorption from his orthodontic treatment as a result of the following factors:

[a] Duration of treatment – Mr Folkema underwent a 26 month treatment programme in Dr Quick's practice and he had already started orthodontic treatment before that, when the fixed appliances were placed on his upper and lower teeth in Peru. Dr Quick reported 30 active appointments. Three of the appointments were for oral hygiene with bleeding and inflammation, and ten were for emergency breakages. Though not part of the same treatment which commenced in Peru and continued with Dr Quick, there were also unknown periods of treatment with Dr Dearing. Dr Quick considered this to be an "extended" length of treatment. However, it is the case that the treatment for malocclusion started in Peru and continued in New Zealand.

[b] Extensive tooth movement – Mr Folkema presented for treatment with seriously misaligned teeth (severe malocclusion); his upper teeth

²⁴ Rakhshan, Nateghian and Ordoubazari, above n 2, at 53 and 55.

²⁵ Weltman and others, above n 1, at 462.

protruded over his lower teeth (severe overbite/overjet). Given the severity of the condition, substantial tooth movement was required.

- [c] Force of bite – Dr Gilbert commented since Mr Folkema has a very low anterior face height, the force of his bite (occlusal force) is higher than normal and this could lead to root resorption. Similarly, Dr Quick suggested Mr Folkema’s traumatic bite a factor contributing to his root resorption.
- [d] Premolar extractions – Three of Mr Folkema’s upper premolars (with evidence of short roots) were extracted.
- [e] Susceptibility of incisors – Mr Folkema’s orthodontic treatment focused on his incisors, and his upper incisors appear to have been the most affected by root resorption.

[68] I do not accept the Corporation’s submission (which was based on Dr Gilbert’s second report dated 30 October 2020) that Mr Folkema was more susceptible because he refused orthognathic surgery. In my view, if Mr Folkema had chosen to undergo that surgery, less orthodontic treatment would have been necessary, which would have meant that less root resorption may have occurred, but that does not mean that the failure to get treatment somehow increased his susceptibility.

[69] Finally, I note that some of these factors led Dr Gilbert to opine there was no normal range of root resorption for Mr Folkema. He opined in his report, dated 30 October 2020:

Mr Folkema’s presenting malocclusion was most unusual, and unlikely to have been seen sufficiently often for there to be a normal range of outcomes.

(Emphasis added)

[70] I take this statement to mean that, for someone with the particular susceptibilities and presenting condition and circumstances of Mr Folkema, the ordinary range of outcomes is likely to be more severe than normal.

[71] Having assessed Mr Folkema's root resorption, I turn to consider Mr Hinchcliff's submission that treatment should have been suspended in December 2017 after root resorption had been diagnosed. In December 2017, Dr Quick indicated three options for treatment. His report of June 2019 provides that treatment continued with caution and the appliances removed in April 2018. Dr Gilbert was informed of the basis the treatment continued and there is no view from him or evidence from any other specialist that treatment should have been suspended in December 2017.

[72] For the sake of completeness, Mr Hinchcliff submitted the Corporation did not follow the directions of the Reviewer and obtain radiographs from a dental specialist to determine the amount of root resorption. Having perused the Review directions, the Court observes the Reviewer directed the Corporation obtain expert advice on the extent of resorption and consider whether this was within the normal range of expected outcomes. This expert advice was obtained from Dr Gilbert who opined it was not possible to determine the extent of resorption.

Summary

[73] Taken together, the evidence before me shows it was not possible to determine the degree of root resorption which occurred in this case. Further, there is no suggestion in the available reports that the root resorption which occurred was outside the normal range taking into account the circumstances of treatment and Mr Folkema's circumstances.

[74] I conclude the evidence shows that Mr Folkema was at a greater risk of root resorption. In particular, the following factors are relevant: treatment duration, extensive tooth movement during treatment, Mr Folkema's bite, three premolar extractions, and susceptibility of incisors. Having regard to all the available evidence, I conclude the root resorption suffered by Mr Folkema was within the normal range of outcomes having regard to his circumstances and the treatment.

Decision

[75] Accordingly, the Court finds the root resorption suffered by Mr Folkema is an ordinary consequence of the orthodontic treatment received by him.

[76] The appeal is dismissed.

[77] There is no issue as to costs.

A handwritten signature in blue ink, reading "Denese Henare". The signature is written in a cursive style with a large initial 'D'.

Judge Denese Henare
District Court Judge

Solicitors: ACC Employment Law, Auckland for the appellant
Medico Law, Auckland for the respondent