·临床研究·

# 桂西地区人群下颌第二磨牙牙根和根管形态的CBCT研究

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【摘要】 目的 应用CBCT观察桂西地区人群下颌第二磨牙牙根和根管的形态,为临床诊疗工作提供参考依据。方法 符合纳入标准的564例患者下颌第二磨牙1 128颗,应用Planmeca Romexis CBCT机及其自带的图像分析软件,统计分析患者各牙根、根管形态的性别、年龄和民族间差异及双侧牙根和根管对称情况。结果 1 128颗下颌第二磨牙中,壮族662颗,汉族384颗,其他民族82颗;双根型和C形根型占比较高,分别为73.94%和24.47%;双根型检出率男性高于女性,C形根型检出率女性高于男性($P<0.05$);壮族人群的牙根分型主要以双根型为主($P<0.01$)。双根型下颌第二磨牙的近中根Ⅳ型发生率最高($P<0.01$),远中根Ⅰ型发生率最高($P<0.01$)。C形根管在根管口处较为连续,越向下,连续性越差;在根管口、根中部和根尖部三个不同水平面中,根管口以C1型为主,根中部和根尖部均以C3型为主($P<0.01$)。双侧牙根和根管对称性的差异在不同性别组、年龄组、民族组间均具有统计学意义($P<0.05$):男性高于女性,18~35岁年龄组较高,壮族比汉族高。结论 桂西地区人群下颌第二磨牙牙根和根管形态复杂多变,壮族、汉族人群牙根分型以双根型为主,C形根也较多见,壮族人群双侧牙根和根管对称性高于汉族人群。

【关键词】 桂西地区; 壮族; 汉族; 下颌第二磨牙; 牙根; 根管; 锥形束CT; C形根管; 对称性

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**CBCT study of the root and root canal morphology of mandibular second molars in a population in western Guangxi** XING Huiyan, HU Yuping, JIANG Wenqiong, ZHANG Ran, WEI Fangyuan, TAN Yanning, DENG Min, LI Shufang. Department of Stomatology, Affiliated Hospital of Youjiang Medical College for Nationalities, Baise 533000, China

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【Abstract】 **Objective** To observe the root and root canal morphology of mandibular second molars in Western Guangxi by CBCT, to provide a reference for clinical diagnosis and treatment. **Methods** In total, 564 patients′ 1 128 mandibular second molars that satisfy the inclusion criteria were analyzed with a planmecaromexis CBCT machine and its own image analysis software. The patients′ gender, age and ethnic differences in the root and canal morphology and the symmetry of the bilateral root and canal were statistically analyzed. **Results** Among the 1 128 mandibular second molars, 662 were the Zhuang ethnic group and 384 were the Han ethnic group, and 82 were other ethnic groups; the double root type and C-shaped root type accounted for a relatively high proportion: 73.94% and 24.47%, respectively. The detection rates of the double root type were higher in males than in females ($P < 0.05$); the detection rates of the C-shaped root type were higher in females than in males ($P <0.05$); the root type of the teeth was mainly double-rooted in the Zhuang ethnic group ($P < 0.01$). The incidence of type IV in the mesial root of the double root type mandibular sec-

ond molar was the highest ($P < 0.01$), and the incidence of type I in the distal root was the highest ($P < 0.01$). The C-shaped root canal is more continuous at the mouth of the root canal, more downward corresponds to a worse continuity: in three different levels of root canal orifice, root middle and root apex, the root canal orifice is dominated by the C1 type, and both root middle and root apex are mainly C3-type ($P < 0.01$). The difference in symmetry of bilateral roots and root canals was statistically significant among different gender groups, age groups, and ethnic groups ($P < 0.05$): there were more males than females, the results in the 18-35-year-old group and the Zhuang ethnic group were higher.

**Conclusion**　The root and root canal morphology of mandibular second molars in western Guangxi people are complex and changeable. The roots are mainly double root type in the Han ethnic group and the Zhuang ethnic group. C-shaped roots are also common. The detection rate of C-shaped roots in the Zhuang ethnic group was higher, and the symmetry rate of bilateral roots and that of bilateral root canals was higher in the Zhuang ethnic group than in the Han ethnic group.

【**Key words**】　western Guangxi;　the Zhuang ethnic group;　the Han ethnic group;　mandibular second molar;　root;　root canal;　cone-beam CT;　C-shaped canal system;　symmetry

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下颌第二磨牙是仅次于下颌第一磨牙的龋病好发牙位,它位于牙弓后段,具有根管口隐蔽、可视性差、易出现C形根管等特点,因此在下颌第二磨牙根管治疗的过程中易出现根管穿孔、根管堵塞、根尖偏移、遗漏根管等问题,导致治疗失败[1]。牙齿是一个重要的人类学特征[2],牙根及根管形态受地域、种族等因素[3-4]影响,因此有必要对不同地域、民族人群下颌第二磨牙的牙根和根管特征进行全面系统的研究,从而指导临床工作,提高根管治疗成功率。CBCT可以在不破坏牙齿的基础上,获取图像质量清晰三维成像的牙根和根管形态特征[5]。研究显示人类第二磨牙牙根和根管形态在不同地区和种族有差异[2]。因此,本研究使用CBCT对桂西地区人群下颌第二磨牙牙根和根管形态进行研究,以期为桂西地区下颌第二恒磨牙根管治疗工作提供解剖学依据。

# 1　资料和方法

## 1.1　资料收集

收集广西壮族自治区百色市右江民族医学院附属医院口腔科2018年1月至2020年1月患者因治疗需要行CBCT扫描所得的影像学资料共805例。通过对所有患者进行身份证号码分析和电话询问患者本人及其父母籍贯、民族,确定其为桂西地区人群。患者本人及父母均为壮族计为壮族,患者本人及父母均为汉族计为汉族。

下颌第二磨牙纳入标准:①牙冠、牙根、根尖孔发育完整,无牙根吸收、严重的根管钙化、牙根纵裂;②无牙体牙髓病变、根尖周病变,无牙周病,所在牙位无牙槽骨病变;③根管未行治疗;④图像辨别清晰,无伪影;⑤年龄≥18岁。

经过严格筛选确定564例患者(每例患者均有2颗健康的下颌第二磨牙)共1 128颗下颌第二磨牙作为研究对象,其中男305例,女259例,壮族331例,汉族192例,其他民族41例,年龄范围为18～78岁,平均年龄为(33.40±12.14)岁。

## 1.2　仪器和方法

采用CBCT机(PLANMECA公司,芬兰)及其成像系统(Planmeca Romexis3.3.3.R软件,PLANMECA公司,芬兰)对颌面部进行扫描,采用Feldkamp型反投影重建算法进行三维重建,分别在冠状面、矢状面、横断面上,观察和记录下颌第二磨牙的牙根及根管系统。所有CBCT影像资料均2名牙体牙髓病专科医师完成观察分析,如遇意见不统一的情况,另外请牙体牙髓病专科医师给予评价,最终确认根管形态。

## 1.3　指标与分类

### 1.3.1　牙根形态　分为5型:三根型、双根型、C形根型、锥形融合根型、其他型。

### 1.3.2　根管形态　按Vertucci法[6]为基础分9型:Ⅰ型(1-1)、Ⅱ型(2-1)、Ⅲ型(1-2-1)、Ⅳ型(2-2)、Ⅴ型(1-2)、Ⅵ型(2-1-2)、Ⅶ型(1-2-1-2)、Ⅷ型(3-3)、其他型(不能纳入前述各型者)。此根管形态不包括C形根管。

### 1.3.3　C形根管形态　按改良Melton法[7]分为5型:C1型、C2型、C3型、C4型、C5型。

## 1.4 统计学分析

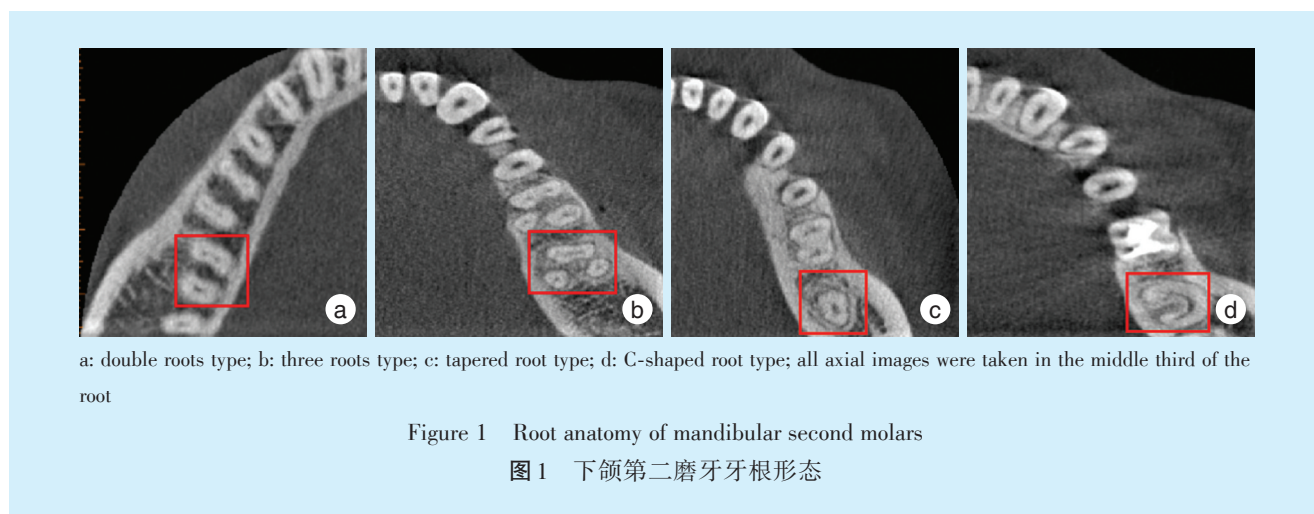将图像资料按照性别、年龄（年轻组18~35岁，中年组36~55岁，年长组56~78岁）、民族（壮族、汉族、既非壮族组又非汉族组为其他组）分组统计分析各牙根、根管形态及双侧牙根和根管对称情况。

数据使用R语言3.6.1统计软件处理，差异性研究使用卡方检验分析，检验水准 $\alpha = 0.05$。当统计组样本量 $n \geqslant 40$ 且所有 $T \geqslant 5$ 时，采用Pearson检验；当 $n \geqslant 40$ 但有 $1 \leqslant T < 5$ 时，采用连续性校正卡方检验；当 $n < 40$ 或 $T < 1$，或检验所得 $P$ 值接近检验水准，采用Fisher确切概率法检验。

## 2 结 果

### 2.1 下颌第二磨牙的牙根形态

1 128颗下颌第二磨牙，双根型占73.94%（834/1 128），C形根型占24.47%（276/1 128），锥形融合根型占1.24%（14/1 128），三根型占0.35%（4/1 128），未发现其他牙根分型（图1）。



a: double roots type; b: three roots type; c: tapered root type; d: C-shaped root type; all axial images were taken in the middle third of the root

Figure 1 Root anatomy of mandibular second molars

图1 下颌第二磨牙牙根形态

下颌第二磨牙牙根形态的分布如表1所示。 4种牙根分型的男女差异均有统计学意义（$P < 0.05$）。

表1 1 128颗下颌第二磨牙的牙根形态

Table 1 Root morphology of 1 128 mandibular second molars n(%)

| Type | Total | Gender | | $\chi^2$ | $P$ | Age (year) | | | $\chi^2$ | $P$ | Ethnic groups | | | $\chi^2$ | $P$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Male | Female | | | 18-35 | 36-55 | 56-78 | | | Zhuang | Han | Others | | |
| Three roots | 4 | 4(0.35) | 0(0) | 4.00 | 0.046 | 2(0.18) | 2(0.18) | 0(0) | 2.00 | 0.368 | 2(0.18) | 1(0.09) | 1(0.09) | 0.50 | 0.779 |
| Double roots | 834 | 486(43.09) | 348(30.85) | 22.83 | $1.77E^{-6}$ | 503(44.59) | 288(25.53) | 43(3.81) | 381.12 | $1.75E^{-83}$ | 495(43.88) | 280(24.82) | 59(5.23) | 341.92 | $5.66E^{-75}$ |
| Tapered root | 14 | 3(0.26) | 11(0.98) | 4.57 | 0.033 | 10(0.89) | 4(0.35) | 0(0) | 10.86 | 0.004 | 10(0.89) | 4(0.35) | 0(0) | 10.86 | 0.004 |
| C-shaped root | 276 | 117(10.37) | 159(14.10) | 6.39 | 0.011 | 183(16.22) | 78(6.91) | 15(1.33) | 156.59 | $9.94E^{-35}$ | 155(13.74) | 99(8.78) | 22(1.95) | 96.93 | $8.93E^{-22}$ |
| Total | 1 128 | 610 | 518 | | | 698 | 372 | 58 | | | 662 | 384 | 82 | | |

The age groups are as follows: 18-35 years old (young); 36-55 years old (middle); 56-78 years old (senior); others in ethic groups: neither the Zhuang nor the Han ethnic group

双根型的检出率男性高于女性（$P < 0.05$），C形根型的检出率则为女性高于男性（$P < 0.05$）；双根型和C形根型年轻组检出率最高（$P < 0.01$）；壮族人群的牙根分型主要以双根型为主（$P < 0.01$）。

### 2.2 下颌第二磨牙的根管形态

2.2.1 双根型下颌第二磨牙的根管形态 834颗双根型下颌第二磨牙中检测到Ⅰ型、Ⅱ型、Ⅲ型、Ⅳ型、Ⅴ型5种根管分型，未发现其他根管分型。

患者双根型下颌第二磨牙近、远中根根管形态的性别、年龄和民族差异如表2、表3所示。

近中根Ⅳ型发生率最高（$P < 0.01$），远中根Ⅰ型发生率最高（$P < 0.01$）。近中根Ⅳ型的检出率男性高于女性（$P < 0.05$），远中根Ⅰ型女性高于男性（$P < 0.05$）；壮族人群的近中根根管分型主要以Ⅳ型为主（$P < 0.01$），远中根根管分型主要以Ⅰ型为主（$P < 0.01$）；年轻、中年、年长组人群的近中根根

**表2**　834颗双根型下颌第二磨牙近中根根管形态的年龄、性别和民族差异

Table 2　Age, gender and ethnic differences in the mesial root canal morphology of 834 double-rooted mandibular second molars　n(%)

| Type | Total | Gender | | $\chi^2$ | P | Age (year) | | | $\chi^2$ | P | Ethnic groups | | | $\chi^2$ | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Male | Female | | | 18-35 | 36-55 | 56-78 | | | Zhuang | Han | Others | | |
| I | 223 | 103(12.35) | 120(14.39) | 1.30 | 0.255 | 133(15.94) | 82(9.83) | 8(0.96) | 106.29 | $8.32E^{-24}$ | 130(15.59) | 80(9.59) | 13(1.56) | 92.73 | $7.32E^{-21}$ |
| II | 65 | 37(4.44) | 28(3.36) | 1.25 | 0.264 | 41(4.92) | 21(2.52) | 3(0.36) | 33.35 | $5.72E^{-8}$ | 30(3.60) | 31(3.72) | 4(0.48) | 21.63 | $2.01E^{-5}$ |
| III | 60 | 40(4.80) | 20(2.39) | 6.67 | 0.010 | 46(5.51) | 13(1.56) | 1(0.12) | 54.30 | $1.62E^{-12}$ | 39(4.68) | 15(1.80) | 6(0.72) | 29.10 | $4.80E^{-7}$ |
| IV | 384 | 246(29.50) | 138(16.55) | 30.38 | $3.56E^{-8}$ | 214(25.66) | 144(17.27) | 26(3.12) | 141.06 | $2.34E^{-31}$ | 227(27.22) | 133(15.95) | 24(2.87) | 161.27 | $9.59E^{-36}$ |
| V | 102 | 60(7.19) | 42(5.03) | 3.18 | 0.075 | 69(8.27) | 28(3.36) | 5(0.60) | 61.82 | $3.76E^{-14}$ | 69(8.27) | 21(2.52) | 12(1.43) | 55.24 | $1.01E^{-12}$ |
| Total | 834 | 486 | 348 | | | 503 | 288 | 43 | | | 495 | 280 | 59 | | |

The age groups are as follows: 18-35 years old (young); 36-55 years old (middle); 56-78 years old (senior); others in ethic groups: neither the Zhuang nor the Han ethnic group

**表3**　834颗双根型下颌第二磨牙远中根根管形态的年龄、性别和民族差异

Table 3　Age, gender and ethnic differences in the distal root canal morphologyof 834 double-rooted mandibular second molars　n(%)
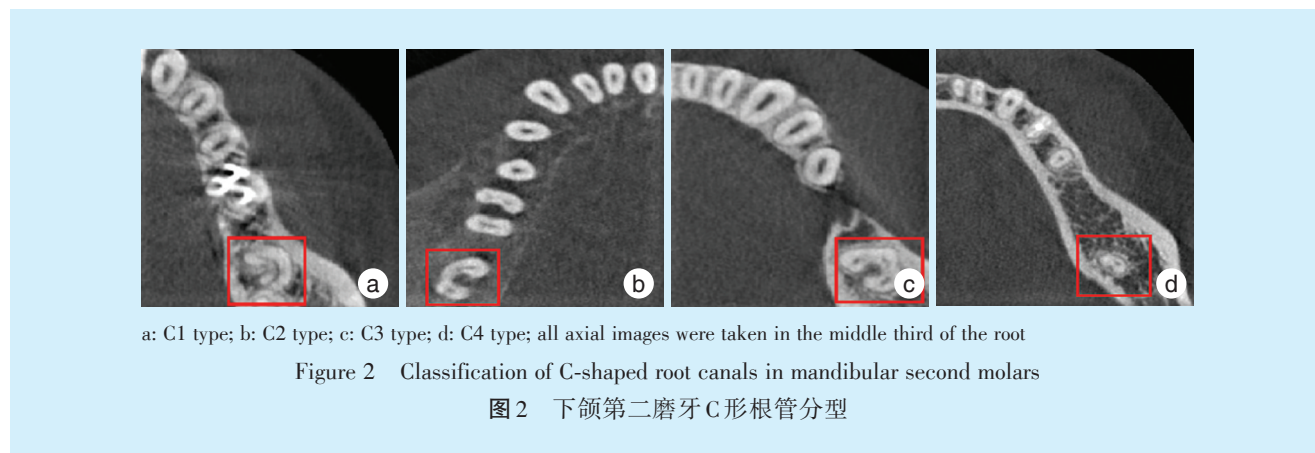
| Type | Total | Gender | | $\chi^2$ | P | Age (year) | | | $\chi^2$ | P | Ethnic groups | | | $\chi^2$ | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Male | Female | | | 18-35 | 36-55 | 56-78 | | | Zhuang | Han | Others | | |
| I | 795 | 458(54.91) | 337(40.41) | 18.42 | $1.78E^{-5}$ | 480(57.55) | 273(32.73) | 42(5.04) | 362.33 | $2.09E^{-79}$ | 472(56.60) | 266(31.89) | 57(6.83) | 324.96 | $2.73E^{-71}$ |
| II | 8 | 6(0.72) | 2(0.24) | 2.00 | 0.157 | 6(0.72) | 2(0.24) | 0(0) | 7.00 | 0.030 | 5(0.60) | 3(0.36) | 0(0) | 4.75 | 0.093 |
| III | 2 | 2(0.24) | 0(0) | 2.00 | 0.157 | 1(0.12) | 0(0) | 1(0.12) | 1.00 | 0.607 | 1(0.12) | 1(0.12) | 0(0) | 1.00 | 0.607 |
| IV | 21 | 14(1.68) | 7(0.84) | 2.33 | 0.127 | 9(1.08) | 12(1.44) | 0(0) | 11.14 | 0.004 | 12(1.44) | 7(0.84) | 2(0.24) | 7.14 | 0.028 |
| V | 8 | 6(0.72) | 2(0.24) | 2.00 | 0.157 | 7(0.84) | 1(0.12) | 0(0) | 10.75 | 0.005 | 5(0.60) | 3(0.36) | 0(0) | 4.75 | 0.093 |
| Total | 834 | 486 | 348 | | | 503 | 288 | 43 | | | 495 | 280 | 59 | | |

The age groups are as follows: 18-35 years old (young); 36-55 years old (middle); 56-78 years old (senior); others in ethic groups: neither the Zhuang nor the Han ethnic group

管分型均以Ⅳ型为主（P<0.01）；远中根根管分型均以I型为主（P<0.01）。

2.2.2　C形根型下颌第二磨牙的根管形态　276颗

C形根型下颌第二磨牙中检测到C1、C2、C3、C4共4种根管分型，未发现其他根管分型（图2）。



a: C1 type; b: C2 type; c: C3 type; d: C4 type; all axial images were taken in the middle third of the root

Figure 2　Classification of C-shaped root canals in mandibular second molars

图2　下颌第二磨牙C形根管分型

C形根管自根管口至根尖部不同的截面其形态各异，大多数表现为在根上1/3有较高的连续性，而在根中1/3、根尖1/3差异性较大：在根管口、根中部和根尖部三个不同水平面中，下颌第二磨牙C形根管分型间差异具有统计学意义（P<0.05），其中根管口主要以C1型为主，根中部和根尖部均以C3型为主（P<0.01）（表4～表6）。

在根管口，男性和女性均以连续性较好的C1型为主；在根中部，男性以C2型为主，女性以C3型为主；在根尖部，男性和女性均以C3型为主，C3型检出率女性高于男性（P<0.05）。

在根管口，年轻组和中年组以C1型为主，在根

表4　276颗C形根型下颌第二磨牙根管口根管形态的年龄、性别和民族差异

Table 4　Age, gender and ethnic differences in the root canal orifice morphology of 276 C-shaped mandibular second molars　　n(%)

| Type | Total | Gender | | $\chi^2$ | $P$ | Age (year) | | | $\chi^2$ | $P$ | Ethnic groups | | | $\chi^2$ | $P$ |
| | | Male | Female | | | 18-35 | 36-55 | 56-78 | | | Zhuang | Han | Others | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| C1 | 186 | 83(30.07) | 103(37.32) | 2.1 | 0.143 | 135(48.91) | 45(16.30) | 6(2.17) | 141.19 | 2.19E$^{-31}$ | 110(39.86) | 63(22.83) | 13(4.71) | 75.90 | 3.29E$^{-17}$ |
| C2 | 50 | 24(8.70) | 26(9.42) | 0.08 | 0.777 | 28(10.14) | 16(5.80) | 6(2.17) | 14.50 | 0.001 | 23(8.33) | 22(7.97) | 5(1.81) | 12.28 | 0.002 |
| C3 | 40 | 10(3.62) | 30(10.87) | 10.00 | 0.002 | 20(7.25) | 17(6.16) | 3(1.09) | 12.35 | 0.002 | 22(7.97) | 14(5.07) | 4(1.45) | 12.20 | 0.002 |
| Total | 276 | 117 | 159 | | | 183 | 78 | 15 | | | 155 | 99 | 22 | | |

The age groups are as follows: 18-35 years old (young); 36-55 years old (middle); 56-78 years old (senior); others in etic groups: neither the Zhuang nor the Han ethnic group

表5　276颗C形根型下颌第二磨牙根中部根管形态的性别、年龄和民族差异

Table 5　Age, gender and ethnic differences in the middle of root canal morphology of 276 C-shaped mandibular second molars　n(%)

| Type | Total | Gender | | $\chi^2$ | $P$ | Age (year) | | | $\chi^2$ | $P$ | Ethnic groups | | | $\chi^2$ | $P$ |
| | | Male | Female | | | 18-35 | 36-55 | 56-78 | | | Zhuang | Han | Others | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| C1 | 37 | 16(5.80) | 21(7.61) | 0.68 | 0.411 | 29(10.51) | 6(2.17) | 2(0.72) | 34.43 | 3.33E$^{-8}$ | 21(7.61) | 12(4.35) | 4(1.45) | 11.73 | 0.003 |
| C2 | 115 | 52(18.84) | 63(22.83) | 1.05 | 0.305 | 84(30.43) | 29(10.51) | 2(0.72) | 91.11 | 1.64E$^{-20}$ | 43(15.58) | 28(10.14) | 44(15.94) | 4.19 | 0.123 |
| C3 | 124 | 49(17.75) | 75(27.17) | 5.45 | 0.020 | 70(25.36) | 43(15.58) | 11(3.99) | 42.21 | 6.83E$^{-10}$ | 74(26.81) | 41(14.86) | 9(3.26) | 51.11 | 7.96E$^{-12}$ |
| Total | 276 | 117 | 159 | | | 183 | 78 | 15 | | | 138 | 81 | 57 | | |

The age groups are as follows: 18-35 years old (young); 36-55 years old (middle); 56-78 years old (senior); others in etic groups: neither the Zhuang nor the Han ethnic group

表6　276颗C形根型下颌第二磨牙根尖部根管形态的性别、年龄和民族差异

Table 6　Age, gender and ethnic differences at the apex of root canal morphology of 276 C-shaped mandibular second molars　n(%)

| Type | Total | Gender | | $\chi^2$ | $P$ | Age (year) | | | $\chi^2$ | $P$ | Ethnic groups | | | $\chi^2$ | $P$ |
| | | Male | Female | | | 18-35 | 36-55 | 56-78 | | | Zhuang | Han | Others | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| C1 | 47 | 17(6.16) | 30(10.87) | 3.60 | 0.058 | 35(12.68) | 9(3.26) | 3(1.09) | 36.94 | 9.54E$^{-9}$ | 24(8.70) | 19(6.88) | 4(1.45) | 13.83 | 0.001 |
| C2 | 38 | 16(5.80) | 22(7.97) | 0.95 | 0.330 | 28(10.14) | 9(3.26) | 1(0.36) | 30.37 | 2.54E$^{-7}$ | 19(6.88) | 14(5.07) | 5(1.81) | 7.95 | 0.019 |
| C3 | 119 | 47(17.03) | 72(26.09) | 5.25 | 0.022 | 78(28.26) | 36(13.04) | 5(1.81) | 67.68 | 2.01E$^{-15}$ | 67(24.28) | 42(15.22) | 10(3.62) | 41.16 | 1.15E$^{-9}$ |
| C4 | 72 | 37(13.40) | 35(12.68) | 0.06 | 0.814 | 42(15.22) | 24(8.70) | 6(2.17) | 27.00 | 1.37E$^{-6}$ | 45(16.30) | 24(8.70) | 3(1.09) | 36.75 | 1.05E$^{-8}$ |
| Total | 276 | 117 | 159 | | | 183 | 78 | 15 | | | 155 | 99 | 22 | | |

The age groups are as follows: 18-35 years old (young); 36-55 years old (middle); 56-78 years old (senior); others in etic groups: neither the Zhuang nor the Han ethnic group

中部,年轻、中年、年长组均以C3型为主,在根尖部,年轻组和中年组均以C3型为主（$P < 0.05$）。

在根管口,C1型壮族检出率最高,在根中部和根尖部,C3型壮族检出率最高（$P < 0.05$）。

2.2.3　锥形根型下颌第二磨牙的根管形态　锥形根型下颌第二磨牙的根管形态如下（图3）。锥形根型下颌第二磨牙的根管形态的性别、年龄和民族差异如下（表7）。其中,根管形态为C形根管的检出率年轻组 > 中年组 > 年长组（$P < 0.05$）。

2.2.4　三根型下颌第二磨牙的根管形态　三根型下颌第二磨牙三个牙根的根管形态分型均为I型。

2.3　下颌第二磨牙双侧牙根和根管对称性

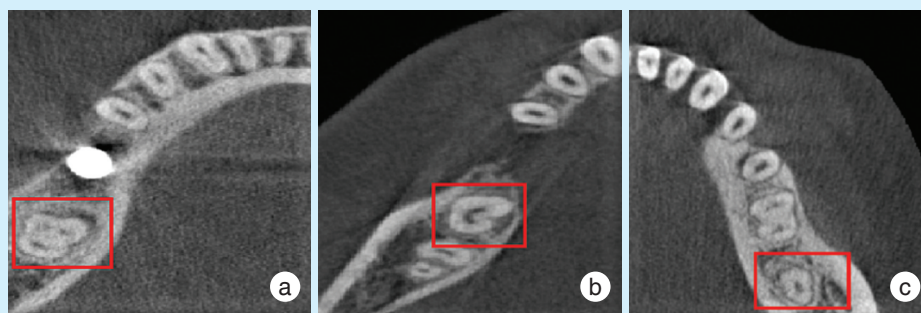下颌第二磨牙的双侧牙根和根管对称性如下（表8）。牙根和根管的双侧对称性男性高于女性（$P < 0.05$）；年轻组 > 中年组 > 年长组（$P < 0.01$）；并且壮族人群的牙根和根管的对称性也明显高于汉族（$P < 0.01$）。

## 3　讨　论

### 3.1　下颌第二磨牙的牙根形态

关于下颌第二磨牙牙根的解剖形态,国内外学者研究的结果是下颌第二磨牙的牙根形态主要以双根型为主,其次是C形根型:在国内,维吾尔族人[8]双根型发生率为70.4%,C形根型发生率为22.4%；而在国外,印度人口[9]双根型发生率为79.35%,C形根型发生率为13.12%；本研究与以上研究结果一致。

本研究中,牙根分型具有性别差异,双根型的

a: multiple root canals; b: C-shaped root canal; c: single root canal

Figure 3　Root canal classification of mandibular second molars with tapered roots

图3　锥形根型下颌第二磨牙根管分型

表7　锥形根型下颌第二磨牙根管形态的性别、年龄和民族差异

Table 7　Age, gender and ethnic differences in root canal morphology of tapered mandibular second molars　　n(%)

| Type | Total | Gender | | $\chi^2$ | P | Age (year) | | | $\chi^2$ | P | Ethnic groups | | | $\chi^2$ | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Male | Female | | | 18-35 | 36-55 | 56-78 | | | Zhuang | Han | Others | | |
| C-shaped root canals | 6 | 1(7.14) | 5(35.71) | 2.67 | 0.102 | 5(35.71) | 1(7.14) | 0(0) | 7.00 | 0.030 | 4(28.57) | 2(14.29) | 0(0) | 4.00 | 0.135 |
| Multiple root canals | 5 | 1(7.14) | 4(28.57) | 1.80 | 0.180 | 3(21.43) | 2(14.29) | 0(0) | 2.80 | 0.247 | 3(21.43) | 1(7.14) | 1(7.14) | 1.60 | 0.449 |
| Single root canal | 3 | 1(7.14) | 2(14.29) | 0.33 | 0.564 | 2(14.29) | 1(7.14) | 0(0) | 2.00 | 0.368 | 2(14.29) | 1(7.14) | 0(0) | 2.00 | 0.368 |
| Total | 14 | 3 | 11 | | | 10 | 4 | 0 | | | 9 | 4 | 1 | | |

The age groups are as follows: 18-35 years old (young); 36-55 years old (middle); 56-78 years old (senior); others in ethic groups: neither the Zhuang nor the Han ethnic group

表8　下颌第二磨牙牙根和根管形态的双侧对称性差异

Table 8　Bilateral symmetry rate of root and root canal morphology of mandibular second molars　　n(%)

| Symmetry category | Total | Gender | | $\chi^2$ | P | Age (year) | | | $\chi^2$ | P | Ethnic groups | | | $\chi^2$ | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Male | Female | | | 18-35 | 36-55 | 56-78 | | | Zhuang | Han | Others | | |
| The root morphology is symmetrical | 505 | 276 | 229 | 4.37 | 0.036 | 308 | 169 | 28 | 232.88 | $2.70E^{-51}$ | 300 | 171 | 34 | 210.23 | $2.23E^{-46}$ |
| The shape of root canal is symmetrical | 410 | 236 | 174 | 9.38 | 0.002 | 249 | 138 | 23 | 186.88 | $2.62E^{-41}$ | 241 | 140 | 29 | 164.55 | $1.85E^{-36}$ |

The age groups are as follows: 18-35 years old (young); 36-55 years old (middle); 56-78 years old (senior); others in ethic groups: neither the Zhuang nor the Han ethnic group

检出率男性高于女性，而C形根型女性高于男性，与黎祺等[10]的结论相同。本研究中，双根型的检出率年轻组最高，壮族人群也主要以双根型为主。

3.2　下颌第二磨牙的根管形态

在亚洲地区，伊朗人群[11]和印度人群[9]双根型下颌第二磨牙近中根根管形态最常见的是Ⅳ型，远中根最常见的均为I型。本研究中，双根型下颌第二磨牙近中根的根管形态主要以Ⅳ型为主。远中根的根管形态主要以I型为主，本研究近中根Ⅳ型检出率男性高于女性（P > 0.05）；这与黎祺等[10]、史志芸等[12]的研究存在差异，以上研究近中根根管分型中I型女性占比更多。

C形根管的舌侧壁薄[13]，根穿孔的风险增加，根管遗漏、根管侧穿和根管预备不足是导致C形根管治疗失败的主要原因，这也提醒根管治疗时要注意C形根管。von Zuben等[2]发现全球样本C形根管发生率为13.9%，而各区域样本C形根管发生率在6.8%（巴西）到44.0%（中国）的范围之间。本研究中下颌第二磨牙C形根管发生率为24.47%，高于沙特人群[14]C形根管发生率。

以前研究发现性别对C形根管的检出率没有显著影响。然而，von Zuben等[2]的研究结果显示，在全球样本中，女性患者的C形根检出率均较高。本研究与该研究及最近的一项研究结果一致[14]，但与Senan等[15]的结果相反，这些结果的差异可能是由于受试者和样本量的差异造成的。

C 形根管自根管口至根尖部不同的截面其形态各异。大多数表现为在根上 1/3 有较高的连续性,而在根中 1/3、根尖 1/3 差异性较大。本研究中,在 3 个不同水平面中,C 形根管分型差异具有统计学意义($P < 0.05$)。在研究方法相同的基础上,这种差异的原因可能是不同的研究者选取的 C 形根管水平面不是同一水平,因为 C 形根管的形态是连续变化的。

### 3.3　下颌第二磨牙双侧牙根与根管的对称性

本研究结果显示,桂西地区人群下颌第二磨牙的双侧牙根对称率为 44.77%,根管对称率为 36.35%,且牙根和根管双侧对称率男性高于女性,18 ~ 35 岁患者较高,壮族人群较高。根管治疗时可以参考患者一侧的下颌第二磨牙的牙根和根管形态,预测和评估对侧同名牙。

综上,本研究与近年国内外学者的数据结果有一定的差异性,可能与地域因素、种族因素、样本量大小、研究方法与标准等因素有关。本研究可为桂西地区壮族人群下颌第二磨牙解剖学形态研究提供一定的参考依据,也可以更好地将人类学和口腔医学学科相结合以提高根管治疗水平。

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