Larissa Pimenta de Pádua

Posicionamento radiográfico odontológico microprocessado para identificação humana cadavérica

Brasília
2015

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Trabalho de Conclusão de Curso apresentado ao Departamento de Odontologia da Faculdade de Ciências da Saúde da Universidade de Brasília, como requisito parcial para a conclusão do curso de Graduação em Odontologia.

Orientador: Malthus Fonseca Galvão

Brasília
2015

À minha família, que sempre me motivou e torceu para que eu sempre realizasse meus sonhos.

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A Deus, pelo dom da vida e pelas pessoas maravilhosas que colocou em meu caminho.

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EPÍGRAFE

“Por vezes sentimos que aquilo que fazemos não é senão uma gota de água no mar. Mas o mar seria menor se lhe faltasse uma gota”.

Madre Teresa de Calcutá

RESUMO

Pádua, Larissa Pimenta de. Posicionamento radiográfico odontológico microprocessado para identificação humana cadavérica. Trabalho de Conclusão de Curso (Graduação em Odontologia) – Departamento de Odontologia da Faculdade de Ciências da Saúde da Universidade de Brasília.

Identificar algo ou alguém é determinar o conjunto de características que as tornam únicas e diferentes de qualquer outro ser ou objeto. De acordo com essa definição, a função do odontolegista é o de coletar todas as evidências e comprovar a identidade de uma pessoa, por meio de um método comparativo. Dentre as informações *antemortem* utilizadas para comparação, destaca-se o exame radiográfico por sua objetividade e maior confiabilidade, possibilitando a individualização de uma pessoa. Este relato de caso tem o objetivo de mostrar um inovador aparelho para posicionamento radiográfico odontológico para facilitar a obtenção de radiografias *postmortem,* resultando na identificação positiva do cadáver, ratificada pelo exame necropapiloscópico.

ABSTRACT

PÁDUA, Larissa Pimenta de. Undergraduate Thesis (Undergraduate Course in Dentistry) – Department of Dentistry, School of Health Sciences, University of Brasília

Identify a person or thing is to determine the set of characteristics that make them unique and different from any other being or object. According to this definition, the function of the forensic dentist is to collect all the evidence and verify the identity of a person by comparative method.

Among the *antemortem* information used for comparison, the radiographic examination stands out for its objectivity and greater reliability allowing the individualization of a person.

This report aimed to present a new radiographic positioning equipment for cadaveric human identification, using an apparatus called "microprocessor tridimentional positioner" to facilitate obtaining *postmortem* radiographs, resulting in positive identification of the body, ratified by necropapiloscopic examination.

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FOLHA DE TÍTULO

Posicionamento radiográfico odontológico microprocessado para identificação humana cadavérica

Dental radiographic positioning microprocessed for cadaveric human identification

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Resumo

Posicionamento radiográfico odontológico microprocessado para identificação humana cadavérica

Resumo

Identificar uma coisa ou pessoa é determinar o conjunto de características que as tornam únicas e diferentes de qualquer outro ser ou objeto. De acordo com essa definição, o trabalho do odontolegista é o de coletar todas as evidências e comprovar a identidade de uma pessoa, por meio de um método comparativo e científico. Dentre as informações *antemortem* utilizadas para comparação, destaca-se o exame radiográfico, por sua objetividade e maior confiabilidade, possibilitando a individualização de uma pessoa. Este relato de caso tem o objetivo de mostrar um inovador aparelho para posicionamento radiográfico odontológico para facilitar a obtenção de radiografias *postmortem,* resultando na identificação positiva do cadáver, ratificada pelo exame necropapiloscópico.

Palavras-chave

Identificação cadavérica, Identificação humana, Odontologia forense, Método comparativo, Técnicas radiográficas *postmortem*

ABSTRACT

Dental radiographic positioning microprocessed for cadaveric human identification

Abstract

Identify a person or thing is to determine the set of characteristics that make them unique and different from any other being or object. According to this definition, the function of the forensic dentist is to collect all the evidence and verify the identity of a person by comparative method.
Among the *antemortem* information used for comparison, the radiographic examination stands out for its objectivity and greater reliability allowing the individualization of a person.
This report aimed to present a new radiographic positioning equipment for cadaveric human identification, using an apparatus called "microprocessor tridimentional positioner" to facilitate obtaining *postmortem* radiographs, resulting in positive identification of the body, ratified by necropapislocopic examination.

Keywords

Cadaver identification, Human identification, Forensic dentistry, Comparative method, *Postmortem* radiographic technique

INTRODUÇÃO

Identidade é o conjunto de características que individualiza algo ou alguém, distinguindo-os dos demais.[1] Identificação é o processo pelo qual se determina a identidade de uma pessoa ou coisa, bem como o conjunto de diligências cujo objetivo é levantar uma identidade.[1] Para se fazer a identificação objetiva do falecido é necessário um método científico, incontroverso, essencial à declaração do término legal da existência da pessoa, com as implicações que acarreta, notadamente na área civil. A falta de uma Declaração de Óbito resulta em complicações legais para os familiares, uma vez que esta é exigida antes da consulta ao testamento, para liberação de seguro de vida ou para a resolução de outros assuntos associados às normas estabelecidas.[2,3] E na esfera criminal, acarreta a extinção da punibilidade pela morte do agente.[4]

Existem vários métodos para identificação de um cadáver, todos feitos por comparação, como o odontológico, o antropológico, o papiloscópico e o genético (DNA).[5] A identificação cadavérica humana pelos cirurgiões-dentistas ocorre em três etapas bem definidas: genérica, específica e individual. Na identificação genérica, o perito define se o material é humano ou não.[6] Na específica, determina-se a idade, o sexo, a estatura e a ancestralidade geográfica. Na individual, comparam-se os elementos *intra-vitae* com os *post-mortem*, que tornam possível uma identificação personalista.[7] As identificações genérica e específica são utilizadas mesmo nos casos onde os registros *antemortem* não estão disponíveis e também quando não há pistas sobre a possível identidade.[6] Um perfil dental *postmortem* é feito pelo perito cirurgião-dentista, apontando características dos prováveis indivíduos, para restringir a procura dos registros *antemortem*,[8] como, por exemplo, o encontro de raízes ainda não mineralizadas, que indica idade jovem. Para a identificação individual é necessária a indicação de um suspeito, cujas características *antemortem* serão comparadas com as *postmortem*.

A identificação cadavérica por meio de registros odontológicos é bem estabelecida e pode ser um dos métodos preferíveis em identificação quando uma vítima está decomposta, esquartejada, espostejada ou incinerada,[9] pois apresenta alto grau de precisão,

muitas vezes superior ao exame genético.[10] Nesses casos, a principal vantagem é que, como qualquer outro tecido duro, a evidência dentária pode ser preservada indefinidamente após a morte.[11] Entretanto, o sucesso de uma identificação estabelecida por meio da análise das particularidades odontológicas depende da existência de características relevantes presentes tanto nos arcos dentários do cadáver como na documentação odontológica apresentada para confronto: prontuários, próteses, radiografias, modelos de gesso, fotografias,[7] registro de mordidas entre outros.

Como exemplo de características relevantes, os seguintes pormenores anatômicos podem ser usados em uma identificação:

a. presença ou não de dentes,
b. formas e dimensões dentárias e radiculares,
c. posições dentárias,
d. raízes residuais,
e. dentes supranumerários,
f. desgastes por atritos ou abrasões,
g. fraturas coronárias,
h. degraus de reabsorção óssea decorrentes de doença periodontal,
i. lesões ósseas, diastemas,
j. formas e linhas das cavidades pulpares,
k. lesões de cárie dentárias,
l. tratamentos endodônticos,
m. pinos intrarradiculares e intracoronários e
n. próteses dentárias.[7,12]

A combinação de dentes hígidos, cariados, ausentes e restaurados é reproduzível e pode ser comparada a qualquer tempo, mesmo com as características dentárias de uma pessoa mudando ao longo de sua vida.[7] Seja de forma natural, pela formação, crescimento e involução do aparelho estomatognático, ou artificial, em decorrência de eventuais tratamentos ou traumas.

As informações obtidas pelo método radiográfico se sobrepõem às de exames clínicos e de anotações feitas no odontograma, pois aquelas não estão sujeitas aos erros de preenchimento das fichas clínicas. Assim, formam registros objetivos da morfologia

das estruturas bucais.[13] Em caso de divergência, prevalece a informação objetiva.

A falta de dispositivos comerciais específicos para a prática de Odontologia forense tais como suportes para posicionamento e fixação de filmes radiológicos intraorais, levou diversos pesquisadores ao desenvolvimento de artefatos, que muitas vezes consistem na simples adaptação ou modificação de produtos facilmente encontrados.[14]

Uma mesma estrutura pode se apresentar radiograficamente de forma diversa, portanto, a elaboração de técnicas padronizadas para tomadas radiográficas *postmortem*, auxilia o perito na análise de questões relacionadas à morfologia das estruturas visualizadas radiograficamente.[5]

Este relato de caso tem o objetivo de mostrar um **inovador aparelho** para posicionamento radiográfico odontológico para facilitar a obtenção de radiografias *postmortem.*

DESCRIÇÃO DO CASO

Em junho de 2014, em uma área de cerrado da região administrativa Ceilândia, um cadáver foi encontrado semienterrado com a patela e os dedos dos pés visíveis. Durante a exumação, notou-se que o cadáver estava em decúbito dorsal, em avançado estado de putrefação, praticamente sem vestes, com punhos e tornozelos amarrados (Figura 1 e 2).

Após a realização dos exames periciais preliminares no local de encontro, o corpo foi levado ao IML-Instituto de Medicina Legal do Distrito Federal para que fossem efetuados os exames necroscópicos rotineiros, com os objetivos de identificar o falecido e determinar a *causa mortis*.

Figura 1: Vista frontal do polo cefálico do cadáver. Avançado grau de decomposição dos tecidos moles.

Figura 2: Os punhos estavam amarrados com segmentos de corda trançada, fita adesiva, fio elétrico e plástico preto. Os tornozelos estavam amarrados com cinto e cabos elétricos preto e branco.

Foi estimado que o cadáver estaria naquele local há aproximadamente 30 dias em avançado grau de decomposição e destruição dos tecidos moles. Os restos mortais foram radiografados de maneira genérica, da forma que chegaram e, após o preparo, por segmentos. Na mesma Delegacia de Polícia

em que foi registrado o encontro do corpo, havia outra ocorrência de desaparecimento de um homem que poderia corresponder a esse cadáver, pela compatibilidade de sexo, estatura, cronotanatognose, localização geográfica e outros. Solicitou-se à família que enviasse ao IML qualquer documentação médica, odontológica, radiográfica ou fotográfica. Foram disponibilizadas seis radiografias odontológicas, três periapicais e três *bitewings*, obtidas em agosto de 2008, seis anos antes da época da morte, quando a vítima teria 35 anos de idade (Figura 3).

Figura 3: Radiografias odontológicas periapicais e interproximais disponibilizadas pela família.

Das radiografias apresentadas, elegeu-se, para fins de comparação radiográfica, a *bitewing* da região posterior inferior direita, pela presença de duas restaurações metálicas com imagens radiográficas muito peculiares nos dentes 47 e 48 e consequente mesialização pendular desses dentes, devido a ausência do dente 46.

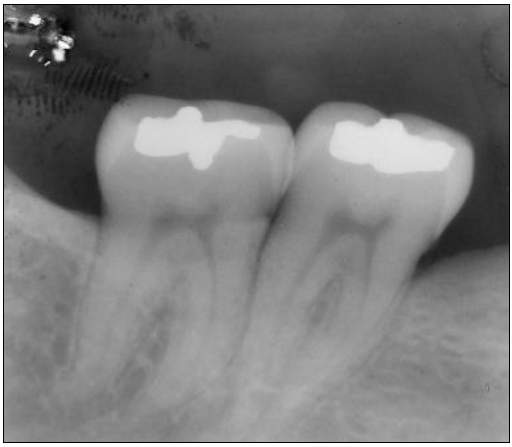

Figura 4: Radiografia periapical *postmortem* dos dentes 47 e 48.

Para a obtenção das radiografias *postmortem* no IML de Brasília é utilizado um aparelho denominado posicionador tridimensional microprocessado, juntamente com um aparelho de Raio x (Figura 4 e 5). Esse aparelho é baseado no microprocessador *Arduino Mega*® que é uma plataforma física de computação de código aberto baseado numa placa microcontroladora simples e em um ambiente de desenvolvimento para escrever o código para a placa. O código é programado no computador e gravado via USB na placa, a partir de quando esta passa a rodar o código como um computador autônomo. A placa Arduino Mega apresenta 54 portas digitais, 16 analógicas, memória de 256 Kb. Possui portas de entrada e saída. As entradas são digitais, do tipo “0” ou “1” ou analógicas, com gradações entre 0 e 255. As saídas são digitais, do tipo “0” ou “1”, entretanto, algumas apresentam o recurso PWM (Pulse Width Modulation) que simulam saídas analógicas. Os dispositivos de entrada de dados podem ser um interruptor, uma resistência variável, um sensor de umidade, uma fotocélula, um sensor de aceleração entre inúmeros outros. Os dispositivos de saída podem ser lâmpadas de LED ligada diretamente à placa, placas gráficas de cristal líquido, motores elétricos convencionais ou de passo e, com a utilização de relés, podemos acionar qualquer equipamento, independentemente da potência necessária.

É possível comandar o suporte móvel por joystick, infravermelho ou diretamente pelo computador, a partir de uma interface gráfica desenvolvida em Visual Basic. Com este programa podemos definir rotinas que movimentarão o crânio e a cada posição predefinida, uma fotografia é obtida de forma automática. Um joystick nada mais é do que duas resistências variáveis, uma para o “x” e outra para o “y”, que fornecem medidas analógicas conforme a direção de seu deslocamento e um interruptor quando se pressiona o manípulo. Pela programação, define-se que quando a leitura da porta analógica “x” for superior a determinado valor, o Arduino altera o estado lógico de algumas portas de saída, movimentando um motor de passo, por exemplo.

Os motores de passo são peculiares, pois permitem movimentos precisos, passo a passo. Em geral este tipo de motor apresenta 200 passos por cada revolução. Portanto, podemos definir o movimento deste tipo de motor com uma precisão de 1,8º.

Acoplando-se um motor de passo a um fuso, reduz-se ainda mais o movimento produzido a partir de cada passo, obtendo-se uma grande precisão no posicionamento.

O suporte utilizado apresenta 3 movimentos independentes. Inclinações lateral e anteroposterior com precisão de 0,0036º e rotação com precisão de 0,098º(que não foi utilizada no caso analisado) e leitura digital dos ângulos de 0,1°.

No presente caso, utilizou-se este suporte de crânio como um suporte de mandíbula, permitindo a obtenção de radiografias com posicionamento preciso.

Figura 5: Posicionador tridimensional microprocessado e aparelho de RX.

Figura 6: Mandíbula acoplada ao posicionador microprocessado.

Levando-se em consideração que a radiografia *antemortem* para comparação tratava-se de uma *bitewing*, a primeira tentativa foi feita com a inclinação normalmente utilizada para esta técnica, de +8º graus, nos eixos vertical e horizontal, e o raio principal incidindo sobre a face vestibular dos segundos molares.[18] Entretanto, sabe-se que nem sempre a inclinação recomendada é seguida pelos profissionais. Por isso, outras radiografias foram feitas mudando a angulação para se assemelharem cada vez mais a *antemortem*.

A radiografia inicial foi obtida com o feixe principal de raios deslocado para a porção mais cervical da coroa e, apenas como referencial, foi considerada sua angulação como referencial (0º, 0º). A partir dessa posição, quatro outras radiografias foram obtidas, com inclinações de 5º em cada plano, sagital e horizontal: (-5°, 0°), (5°, 0°), (0°, -5°) e (0°, 5°).(Figura 7)

Pelas imagens obtidas, estimaram-se, por aproximação, outras inclinações para a obtenção de imagens ainda mais semelhantes à enviada pela família: (-3°, 3°), (-4°, 3°) e (-4°, 2°).(Figura 8 e 9)

Pela comparação entre as imagens *antemortem* e *postmortem*, notaram-se pontos de compatibilidade plena entre o cadáver e o desaparecido, como a ausência antiga do dente 46 e consequente mesialização pendular dos adjacentes posteriores e a presença de restaurações metálicas nos dentes 47 e 48. Tendo em vista que não foram constatadas discordâncias entre as radiografias *antemortem* e *postmortem* e que foram encontradas diversas coincidências, foi possível a identificação positiva do cadáver.

Além do exame odontológico, também foi realizado exame necropapiloscópico, que concluiu que a impressão digital coletada do cadáver era coincidente com a impressão guardada nos arquivos do Instituto de Identificação da Polícia Civil.

(a)

(b)

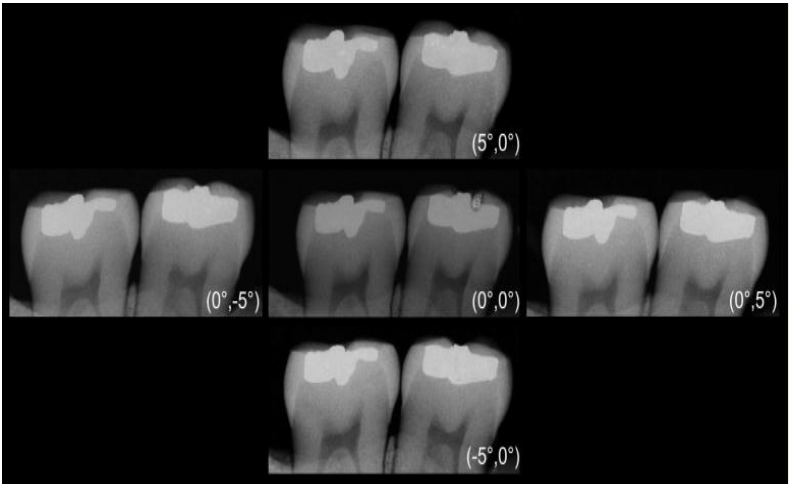

Figura 7: Radiografia superior *antemortem*(a). Composição radiográfica inferior *postmortem* com angulações aproximadas ao exame radiográfico rotineiro.(b)

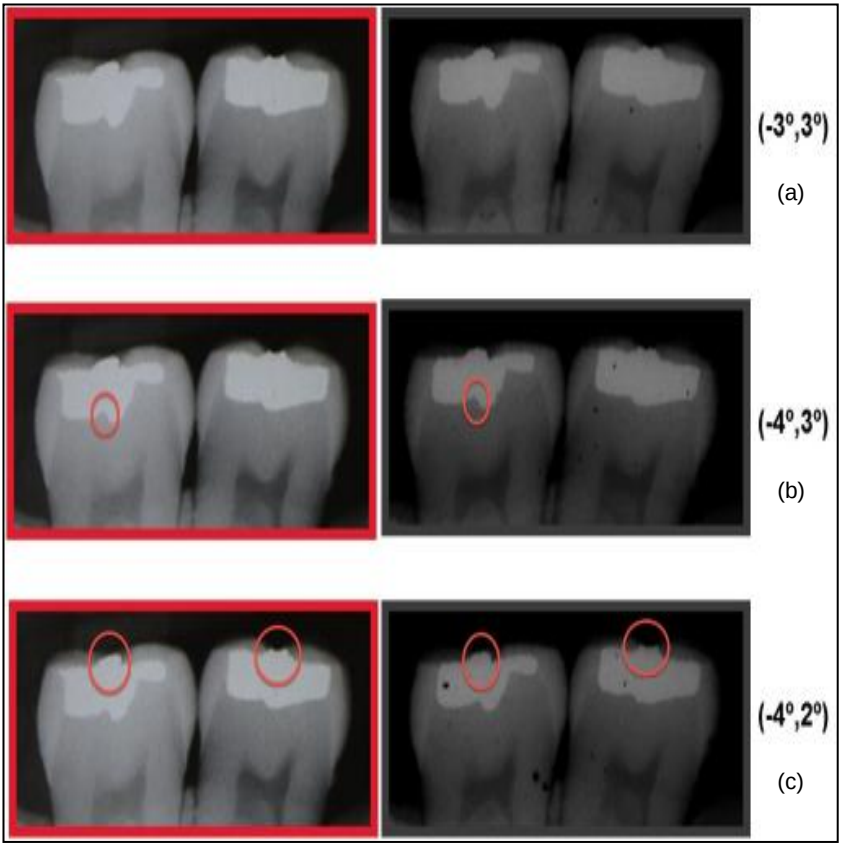

Figura 8: Comparação dos pontos semelhantes nas radiografias *antemortem* (à esquerda) com as *postmortem* (à direita).

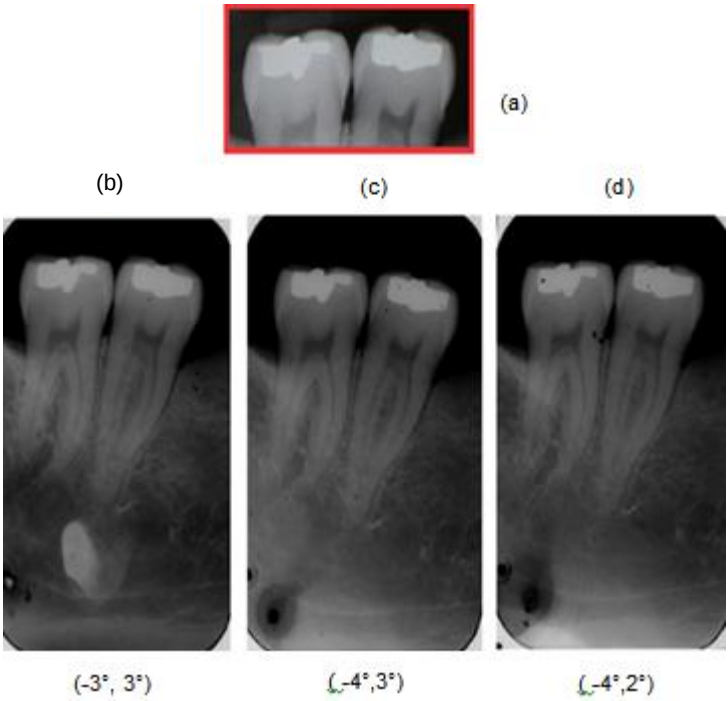

Figura 9: Radiografia *antemortem* (a). Inclinações intermediárias (b, c, d), evidenciando a mesialização dos dentes 47 e 48.

RESULTADO

Pela comparação foram observadas similaridades entre as radiografias enviadas pela família e as reproduzidas no laboratório e, apesar do lapso temporal, não houve divergências excludentes, resultando na identificação positiva do corpo com uma probabilidade muito superior a 99,99999999%.

DISCUSSÃO

A atividade do odontolegista tem contribuído nos processos de identificação *postmortem*, desde os procedimentos iniciais -

identificação genérica, determinação do sexo, estimativa de idade, grupo étnico e estatura - assim como na identificação individual, sendo uma das áreas de atuação do odontolegista mais conhecidas do público.[15]

Os dentes são as estruturas do corpo mais resistentes à degradação e às alterações de pressão, temperatura e umidade,[7] em determinados casos, os arcos dentários podem ser as únicas estruturas remanescentes, tornando o método odontológico o mais adequado para se conseguir a identificação cadavérica. Associadas a esses fatores, outras vantagens do método de identificação dentária são: rapidez, baixo custo, confiabilidade e logística simplificada necessária para aplicação da técnica.[6, 16] A metodologia empregada pelos odontolegistas segue os critérios do processo de identificação: unicidade, perenidade, imutabilidade, classificabilidade e praticabilidade,[6,7] o que proporciona resultados precisos e passíveis de comparação nos casos em que há documentação para confronto.

Para que essa metodologia seja empregada, é necessário que exista uma documentação *antemortem*, como o prontuário odontológico, que pode conter fotografias, radiografias, modelos em gesso, registros[5] e outros.

Com o pressuposto de que não existam duas pessoas com as mesmas características da dentição, os arcos dentários podem ser utilizados para individualizar uma pessoa.[6, 7] Ou seja, quanto mais características relevantes e raras na dentição de uma pessoa, melhor e mais facilitada é a comparação. Dentre os pormenores passiveis de comparação, destaca-se a restauração, cujas características únicas podem ser observadas nas radiografias.[7]

Nos preparos clínicos de restaurações de amálgama, a dentística preconiza uma técnica, direcionando a profundidade e o formato das cavidades. A referida técnica determina que a parede pulpar deve ser aplainada; a profundidade da restauração deve ser de, no mínimo, 1,5 mm com ângulos arredondados; ângulo cavossuperficial deve ser reto e com paredes convergentes para oclusal.[17] Se essas técnicas fossem seguidas, grande parte das restaurações teriam o mesmo formato e gerariam uma mesma imagem radiográfica, o que para a finalidade de identificação seria indesejável. Porém, o que ocorre na prática é bem diferente, pois nem sempre as técnicas são rigidamente

seguidas, resultando em uma infinidade de possibilidades para formatos de cavidades. Quanto menos padronizada e mais irregular for a restauração, melhor será para a identificação, pois gera imagens radiográficas únicas.

No caso relatado, elegeu-se a *bitewing* da região dos molares inferiores direitos para comparação, pela presença características que possibilitaram a comparação: duas restaurações de amálgama de prata de formatos peculiares nos dentes 47 e 48 e pela mesialização deles devido a ausência antiga do dente 46. Em todas a radiografias obtidas foram encontrados pontos de coincidência entre a documentação fornecida pela família e a reproduzidas no laboratório. Devido ao fato de aspectos qualitativos serem utilizados para a identificação odontolegal, não se pode estabelecer um número mínimo de pontos para que um indivíduo seja identificado positivamente pela técnica odontolegal, com variação da quantidade de pontos convergentes conforme cada caso.[16]

Utilizando-se o posicionador tridimensional microprocessado foram obtidas as radiografias *postmortem* para comparação. Este aparelho permitiu o rígido controle da posição e angulação do filme radiográfico, facilitando a obtenção das imagens em diferentes angulações. Como havia grande quantidade de características disponíveis para comparação, qualquer uma dessas radiografias realizadas poderia ser utilizada para se fazer a identificação positiva do cadáver. O grande diferencial desse aparelho é quando há poucas características para comparação, como pequenos fragmentos de dentes ou restaurações e a angulação *antemortem* e *postmortem* precisam ser as mais coincidentes possíveis, para se afirmar a identidade do cadáver. Porém, mesmo no caso relatado, percebe-se a rapidez do método e resultados precisos em relação as angulações obtidas. A falta desse aparelho não impede a obtenção de radiografias *postmortem* que se prestem à identificação, porém, sem ele, o processo se torna mais trabalhoso, menos controlado, geralmente feito a olho nu e por tentativa e erro. Outras formas de realização dessas radiografias são pelo uso de luvas de procedimentos preenchidas com material espesso (como alginato, gesso ou areia); de cera utilidade, associada ou não a um posicionador radiográfico clínico[5] e de cateter inflado[21] para fixação do filme radiográfico ao segmento ósseo.[5,14] Todas essas

técnicas são válidas, mas em nenhuma delas há o controle rigoroso da posição e da angulação.

CONCLUSÃO

Conclui-se que o método odontológico é eficaz para comparação entre os registros *antemortem* e *postmortem*, resultando na identificação positiva do cadáver com mais de 99% de probabilidade de acerto.
Conclui-se também que o posicionador tridimensional microprocessado possibilita o rígido controle da posição e angulação do filme radiográfico, facilitando a obtenção de várias radiografias *postmortem*. Tornando o processo mais rápido e menos trabalhoso, sem perder a confiabilidade.

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Reference to a book:
[2] W. Strunk Jr., E.B. White, The Elements of Style, fourth ed., Longman, New York, 2000.
Reference to a chapter in an edited book:
[3] G.R. Mettam, L.B. Adams, How to prepare an electronic version of your article, in: B.S. Jones, R.Z. Smith (Eds.), Introduction to the Electronic Age, E-Publishing Inc., New York, 2009, pp. 281–304.

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