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Clinical Report

New Device for Collecting Intra-oral Findings of Unknown Body

Yoichi Hanaoka, Tamiyuki Tsuzuki*, Masaki Yoshida, Kaori Iwahara*, Yuji Suyama***, Takashi Matsukubo***, Yoshinobu Sato** and Kiyoshi Minaguchi**

Department of Forensic Odontology, Tokyo Dental College, 1-2-2 Masago, Mihama-ku, Chiba 261-8502, Japan
* *Center of Legal Medicine of Dentistry, The Nippon Dental University School of Dentistry at Tokyo, 1-9-20 Fujimi, Chiyoda-ku, Tokyo 102-8159, Japan*
** *Department of Legal Medicine, Kyorin University, 6-20-2 Shinkawa, Mitaka-shi, Tokyo 181-8611, Japan*
*** *Department of Epidemiology and Public Health, Tokyo Dental College, 1-2-2 Masago, Mihama-ku, Chiba 261-8502, Japan*

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Abstract

In dental identification, the collection of intra-oral images is extremely important. We propose the Dental Watch® as a new device for collecting intra-oral findings in situations where sufficient jaw-opening or adequate lighting cannot be obtained in such cases of dead bodies within a day after death or burned bodies encountered in mass disaster. This device is an improved home video camera for taking intra-oral images. It is lightweight and cordless, allowing it to be operated with one hand, and an audio function allows comments to be made and recorded on obtaining findings at the same time as images are taken. In addition, this device allows images of the entire oral cavity to be taken comparatively easily, even when only a minimal degree of jaw movement is available. This device is extremely useful in situations where a single dentist inspector must obtain findings and make an accurate and detailed Dental Chart.

Key words: Forensic odontology—Dental identification—Dental Watch®

Introduction

Dental evidence plays a very important role in the identification of unknown bodies, and a lot of cases and new technologies have been reported in this field[1–6]. Information technology (IT) has developed remarkably in recent years, and is now being applied widely in many fields. We have been studying the applicability of IT to personal dental identification.

In this paper, we introduce a new device for collecting intra-oral findings in situations

where sufficient jaw-opening or adequate lighting cannot be obtained.

Materials and Methods

This study obtained actual dental findings from inside the oral cavity of a virtual cadaver using Dental Watch®, an oral imaging system developed by Kanagawa Furniture Co., Ltd. (Chiba), and investigated the usefulness of the system (Fig. 1). Dental Watch® features a video camera with a built-in monitor that has been modified for oral imaging, and is based on an imaging system that is already commercially available. Dental Watch® has been commercially available primarily for clinical use in providing explanations to patients. The current system's camera uses C-MOS sensors, allowing it to capture video, still images, and audio, and it has 300,000 effective pixels. The system's main unit is lightweight at 130 g, weighing only 150 g when the battery and the mirror provided are all installed (Table 1).

Fig. 1 Dental Watch®

Results

The current system is lightweight and cordless, allowing it to be operated with one hand. Obtaining dental findings (Fig. 2) with this system feels almost the same as when using a mirror in a conventional dental examination. The system also allows both visualization on a monitor and macroscopic visualization,

Table 1 Performance characteristics of Dental Watch

Image sensor	1/6.2VGA-CMOS
Effective pixels	300k pixels
Lens	F#: 2.8 Focal length: 30±5mm
Image size	Still picture (megapixels): 2,864×2,152 (6M), 2,048×1,536 (3M), 600×1,200 (2M), 1,024×768 (1M), Movie: VGA640×480, QVGA320×240
File format	Still picture: JPEG, Movie: AVI, Sound: PCM 16bit mono
Shutter speed	1/30sec.
Digital zoom	×4
Exposure compensation	+2, +1, 0 (Auto), −1, −2
White balance	Auto, Fine weather, Cloudy weather, Lamp, Fluorescent lamp
Display	2″LTPSLCD, 130k pixels (558×234), 0–90° opening, 0–280° Rotatable
Memory	SD memory card (till 2GB)
Optional function	Audio mike, Speaker, Digital video, MP3 player, PC camera
Video outlet	NTSC/PAL
Interface	USB2.0 port, AV terminal, Earphone terminal, DC-in
Battery	Rechargeable Li-ion battery
Externals size	94.5 (L)×145 (W)×30 (H) mm
Weight	130g (Main body)

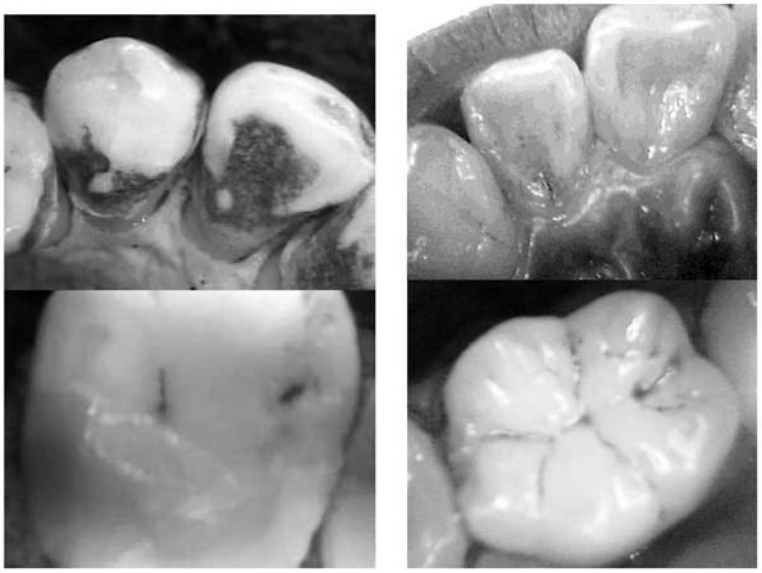

Fig. 2 Still images
The difference is hardly admitted in the image quality between a and b.
a: Images with expensive current CCD camera
b: Images with this device

Fig. 3 Taking images when mouth-opening is limited

and adjustment of the angle of the mirror provided allows the system to record images simultaneously at almost the same angle as used in macroscopic visualization. Even when mouth-opening is limited, the system allows image acquisition of the lingual surface in the anterior tooth and premolar regions and of the occlusal surface in the molar region if mouth-opening of about 70 mm in the anterior tooth region can be achieved (Fig. 3). The system allows image acquisition of the lingual surface in the molar region with mouth-opening of about 120 mm in the premolar region. The system is essentially a video imaging system, so simultaneous recordings of comments on intraoral findings are available with visual images. This makes the system extremely useful when rechecking findings.

Discussion

Recording images of the oral cavity is absolutely essential when obtaining dental findings from an individual. However, imaging using a conventional camera requires some technical ability, and the extent of imaging itself is limited, particularly in cases where mouth-opening is limited. We have previously proposed the use of small scanners and CCD cameras for obtaining dental findings in cases where mouth-opening is limited[5]. However, most of the commercially available CCD cameras are models with cords and a separate monitor, and are certainly quite expensive. The current system's camera is a cordless model with a built-in monitor and is also lightweight, making it easy to operate. Additionally, it is relatively inexpensive in comparison to a conventional CCD camera (about 80% of the price of a CCD camera).

In most instances, oral findings are obtained from a cadaver by having an assistant ensure that the field of vision is clear as the inspector uses a mirror and describes his or her findings, while dentist co-inspector notes those findings on the individual's Dental Chart (DC). Using the current system feels the same as using a standard dental mirror, and the system also features a light source, ensuring that the field of vision is clear.

Another notable feature of the system is its ability to record audio comments along with images of oral findings. During the process of final transcription to the individual's DC, notations can be made while checking both image findings and determinative findings. The system also allows faithful rendering of still images with regard to the shape of prostheses. Even when findings must be rechecked later, decisions about images and findings can be confirmed in the same manner, so the system is extremely useful for checking when a single inspector must obtain findings and make chart notations alone.

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Reprint requests to:
Dr. Yoichi Hanaoka
Department of Forensic Odontology,
Tokyo Dental College,
1-2-2 Masago, Mihama-ku,
Chiba 261-8502, Japan
E-mail: yhanaoka@tdc.ac.jp