Innovative Idea and Possibility

Good Doctors

Multipurpose Intraoral Disease Detector

Multipurpose Intraoral Disease Detector

Digital Dentistry

Consistent with recent trends across dentistry

Limitations of Traditional Methods

Overcome the limitations of dentist's visual observation, radiography, etc., which are the traditional method of detecting dental caries and gum disease, the most frequent oral disease

Improved oral disease detection method

1) Transillumination

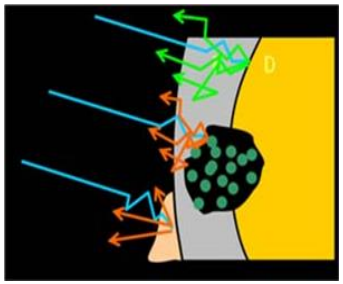
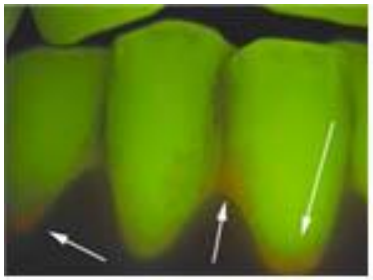
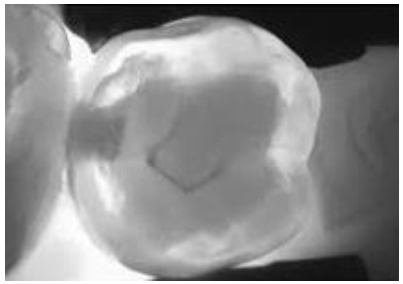
: Observe the inside of the tooth by transmitting a wavelength light source with high bionic transmissive

: Particularly advantageous for detecting caries and micro-cracks in tooth proximal area

2) Fluorescence Based Technology

: Early caries detection using natural fluorescence of teeth

: Detect dental plaque by detecting bacterial fluorescence in the intraoral bacterial porphryrin


Enhanced Intraoral Disease Detection Method

1) Transillumination

- Tooth disease detection method using the property that the enamel of teeth becomes transparent under the near infrared wavelength

- Advantage

: It is possible to observe the inside by penetrating the enamel of the teeth without radiographs of harmfulness

: Especially suitable for detection of caries and fine cracks in tooth proximal area

- Limitation

: Basically, it is difficult to quantify and can be observed only with a black and white image, so it is difficult to distinguish between tooth shape abnormalities and caries or microcracks due to the appearance of teeth with various curves

Another technology on the market is transillumination which involves shining white and near-infrared light on a tooth to detect voids in the tooth. Two key limitations with this technique are: 1) No quantitative measurement is produced; and 2) Subjective interpretation of whether a dark area on the gray-scale images is caries or a dental anomaly leads to many false positives.

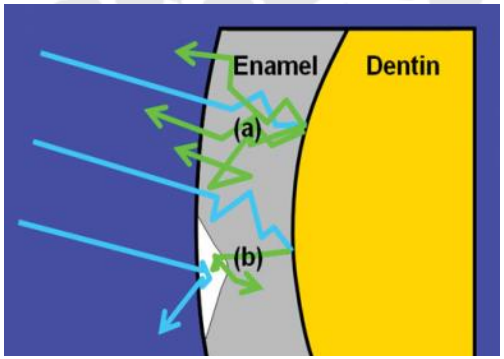
2) Fluorescence Based Technology

- It was first reported by Benedict (1922) that the properties of fluorescence differ after irradiating ultraviolet rays to the tooth enamel with sound teeth and caries
- In 1981, Sweden's Sundstrom and Bjelkhagen presented a quantitative analytic type fluorescence method to distinguish between earlier dental caries and sound teeth

- **When the light of 400nm~490nm is irradiated on the teeth**
  : Sound teeth enamel present green fluorescence
  : Early dental caries area is black or Brown color due to lose fluorescence
  : Progressive caries and plaque present red fluorescence

- **Advantage**
  : Effective in detecting early caries (300~500nm deep, white spot) of teeth
  : A detection method that has many advantages in the detection of dental caries, plaque, and calculus and the detection of microcracks in teeth

- **Limitation**
  : The primary detection target is a method of detecting porphyrins, which are metabolites of the intraoral bacteria. But The primary colony of intraoral bacterium does not produce porphyrins and there is a possibility of false diagnosis due to fluorescence from food debris or coloring matter (Stains, Tartar, prophylaxis paste ETC.)



Can Fluorescence Based Technologies Be Used for Caries Detection?

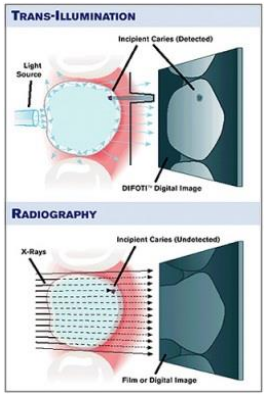
The core technology in most caries detection devices today (e.g., Acteon's SOPROLIFE (Acteon), Air Techniques' Spectra and KaVo's DIAGNODent) is fluorescence.[22] Fluorescence is simply the glow from an object that has absorbed light, such as light from LEDs or lasers. Since bacterial porphyrins, stains, tartar, food debris, and prophylaxis paste all fluoresce under the wavelengths used in these devices, whether or not caries is present,[23,24,25,26,27,28] they can lead to false positive readings and unnecessary treatment. In addition, Streptococcus mutans and lactobacilli, the key bacterial initiators of caries, do not have the porphyrins that fluoresce when exposed to the light emitted by these devices.[29,30,31,32,33]

Market Products

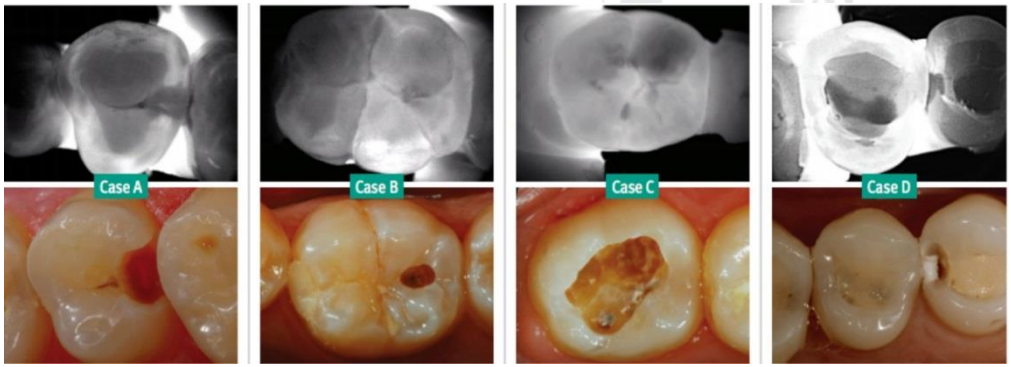
Multipurpose Intraoral Disease Detector

Transillumination

- KAVO (Germany)
- Product Name : DIAGNOcam (CariView)



Technical Specifications	
Current max.	0.5 A
Supply voltage	5 V
Cable length	2.5 m
Weight	190 g
Length approx.	245 mm
Diameter:	30 mm
Lighting	laser diode
Wavelength	780 nm
Opt. power	15 mW
Opt. power as per DIN EN 60825-1	
after the occlusal tips	max. 1 mW

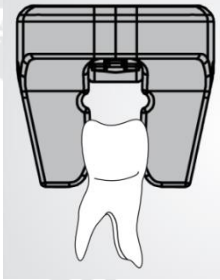


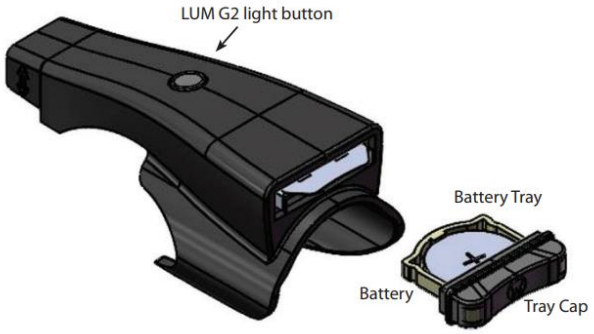
Only the Transillumination is supported and the Fluorescence Based Technology is not supported

Multipurpose Intraoral Disease Detector

Transillumination ?

- **DigitalDOC (U.S.A)**
  Product name: LUM Transillumination (LUM-1000)





- Use Visible white light rather than Near infrared light
- Does not appear to be FDA certified as a Caries Detection Device
- It is a product that is attached to the Intraoral camera and has an inconvenience such as attaching/detaching and changing the camera mode, lighting on/off, battery replacement, etc.
- No fluorescence caries detection function

Multipurpose Intraoral Disease Detector

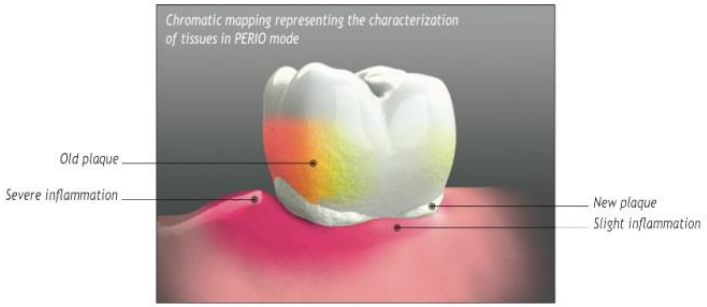
Fluorescence Based Technology

- Acteon imaging (France)

1) Product Name : Soprolife


The fluorescence imagery of SOPROLIFE surpasses the limits of conventional digital radiology

2) Product Name : Soprocare

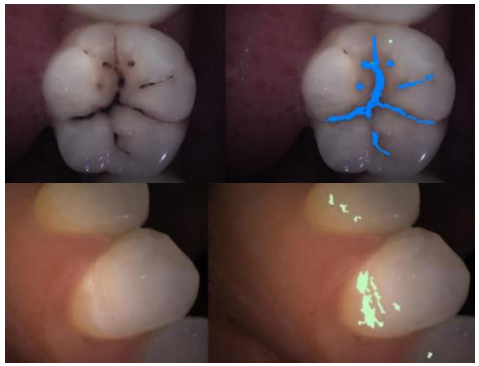


Only the Fluorescence Based Technology is supported and the Transillumination is not supported

Multipurpose Intraoral Disease Detector

Fluorescence Based Technology

- Carehealth Streem (Pre KODAK)
- Product Name : CS1600



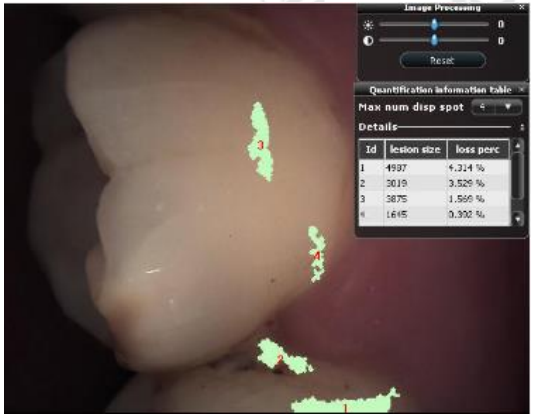
Exclusive Technology

The CS 1600 uses FIRE (Fluorescence Imaging with Reflectance Enhancement) images to determine the degree and associated numerical value of fluorescence loss of suspected lesions.

Fluorescence effect
Under violet-blue illumination, teeth naturally emit yellow-green fluorescence. This emitted fluorescence decreases in demineralized tooth regions.

Reflectance effect
Due to increased light scattering, tooth areas with early caries exhibit stronger diffuse reflectance than sound tooth structures—which in turn causes incipient caries to have a "white spot" appearance.

Most sensitive results
FIRE combines caries signals from fluorescence and reflectance effects to detect incipient caries at a stage when either effect, when taken alone, may be too weak to be recognizable. As a result, by utilizing both fluorescence and reflectance information, FIRE



Only the Fluorescence Based Technology is supported and the Transillumination is not supported

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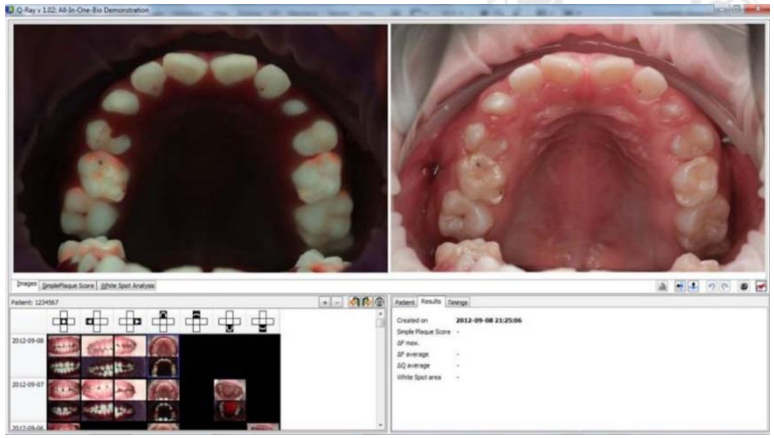
Fluorescence Based Technology

- Inspektor (Netherland) /Aiobio (Korea)

Fig. 14 – Example of QLF images. (a) White light image of early buccal caries effecting the maxillary teeth, (b) QLF image taken at the same time as (a), note the improved detection of lesions as a result of the increased contrast between sound and demineralised enamel, (c) 6 months after the institution of an oral hygiene programme, the lesions have resolved.

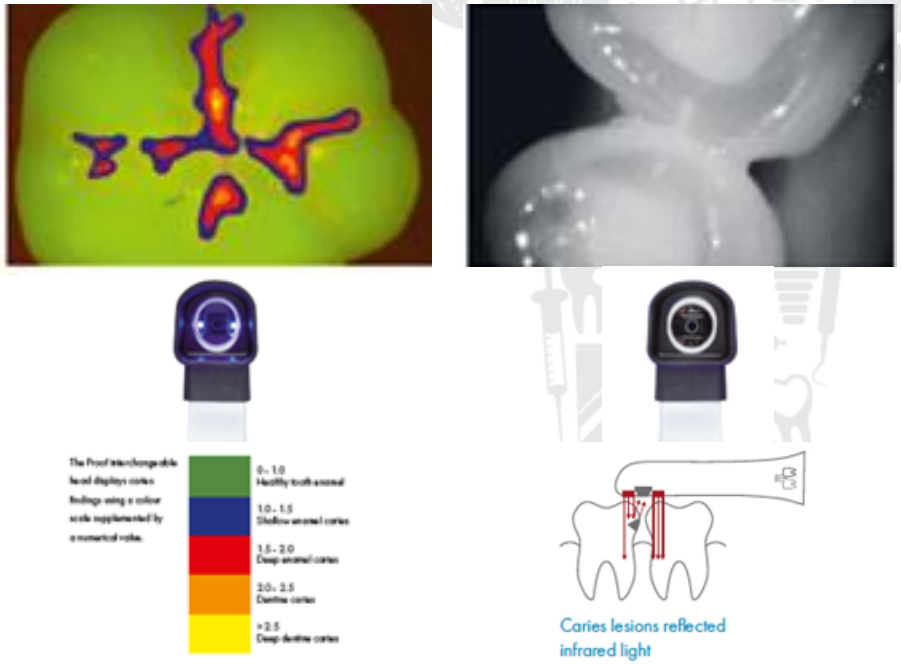


Only the Fluorescence Based Technology is supported and the Transillumination is not supported

Multipurpose Intraoral Disease Detector

Transillumination and Fluorescence Based Technology

- Durr (Germany) / Air Techniques (USA)
- Product Name : VistaCam iX



Although functions such as intraoral camera, transillumination, and fluorescence are possible in one product, in order to change and use the disease detection method, it is necessary to replace the head part of the product and discontinue treatment every time. This is an inconvenient method for both dentists and patients, and it is difficult to obtain comparative images according to disease detection methods at the same location

Strong Points

Full HD
1080p

Multipurpose Intraoral Disease Detector

Autofocus Dental Camera with Mouse

Inspire

Strong Points

- The Full High Definition(FHD) dental camera available from macro to infinite image
- It is the only product in the market that has gained the advantage of overcoming the limitations of intraoral disease detection methods
- Images for diagnosis can be obtained for each intraoral camera and each detection methods
- Three kinds of images for comparative diagnosis at the same location can be obtained with one shot
- Easy to use due to it is a dental handpiece type familiar to dentists
- Easily installed in dental unit chair
- Made of metal, it has excellent durability
- Various colors impressions (3 types of intraoral camera, 2 types of fluorescence) that the user wants can be widely accommodated to the needs of the market
- Provides various convenience functions such as built in mouse function

Strong Points

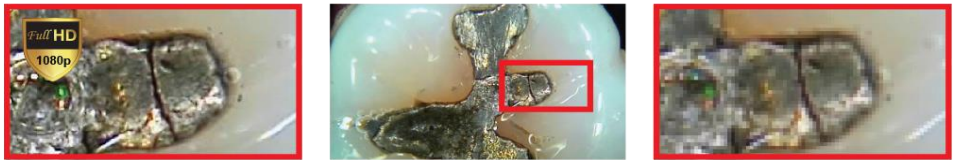
- The cable of the product can be supplied in a fixed or detachable form depending on the buyer's request
- Can be used with most existing dental imaging software worldwide
- Multi Capture Twain Driver provided
- Intraoral camera, transillumination, and fluorescence disease detection are the only products available in one product
- Registration for FDA Class 2 medical device
- Have several Patents

Macro to Infinity Dental Camera Mode

Macro to Infinity Dental Camera Mode
MI mode

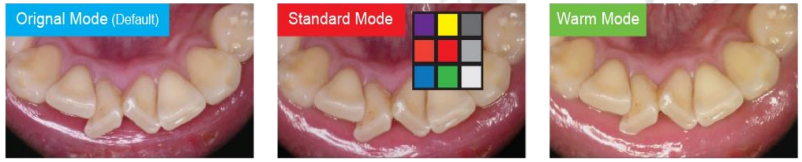
Macro to Infinity
Camera is able to focus from macro mode (close) to infinity that includes a full arch and face shot.

FHD image support
The device shows FHD (1080p) in live image supported by a 5M sensor.



Full HD | Original image | HD

Color impressions
Adjust the color impression on camera to fit different monitors or screen.

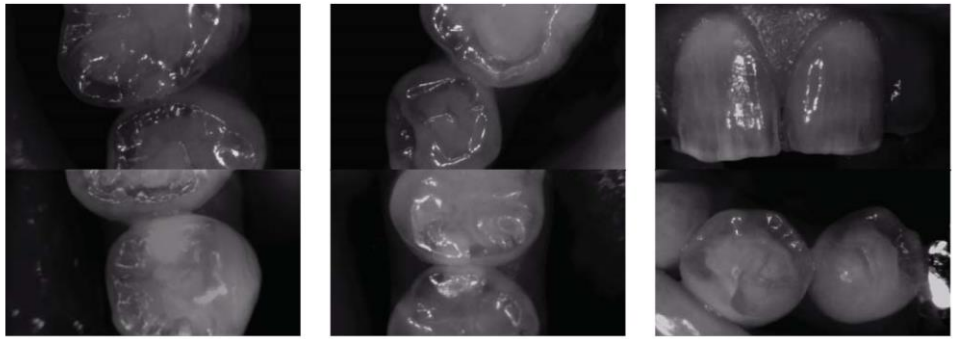


Same color chart image with x-rite

Transillumination Mode

Transillumination mode
TR mode

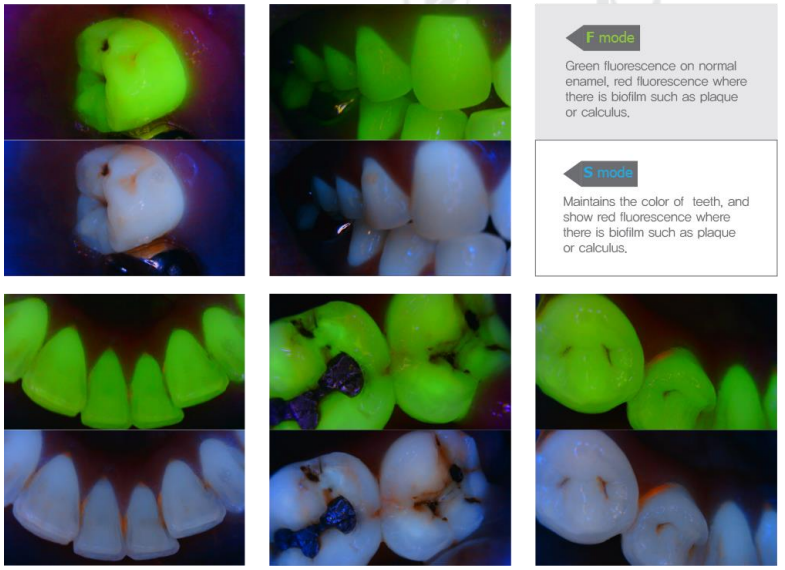
- This camera mode provides the ability to examine the inside of enamel by use of a high transparency light source.
- Useful for detecting proximal caries and micro cracks.
- Advanced technology that allows for an image showing enamel penetration without x-ray radiation.



Fluorescence Mode

Fluorescence mode
FL mode

- Disease detection technology using natural fluorescence that occurs under specific illumination.
- Green fluorescence on normal enamel, red fluorescence where there is biofilm such as plaque or calculus.
- Florescence loss where there is early caries (white spot).
- Useful to detect early caries, tooth crack, secondary caries.
- Able to detect residual composite resin.
- Support F mode and S mode



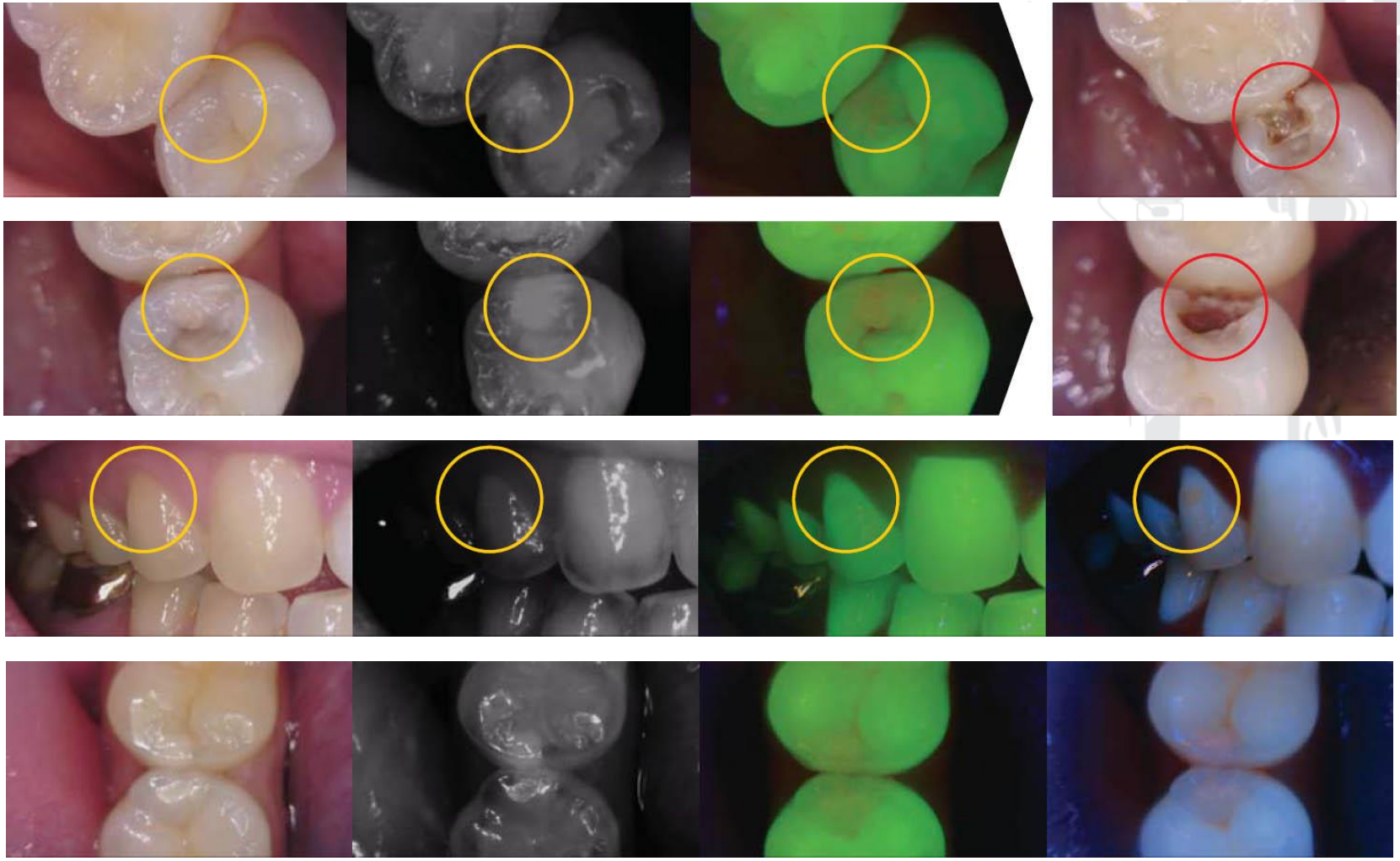
Multi Shot Mode

➢ Limitations on each detection mode

- **MI mode** : Hard to detect early stage caries
- **TR mode** : No quantitative measurement is produced
  Subjective interpretation of whether a dark area on the gray-scale images is caries or a dental anomaly leads to many false positives
- **FL mode** : Bacterial porphyrins, stains, tartar, food debris, and prophylaxis paste all fluoresce under the wavelengths used in these device, whether or not caries is presents, they can lead to false positive readings and unnecessary treatment. In addition, Streptococcus mutans and lactobacilli, the key bacterial initiators of caries, do not have porphyrins that fluoresce when exposed to the light emitted by the device.

Inspire takes advantages of each disease detection mode (MI, TR, FL), and to overcome limits of each detection mode it provide 3 in1 shooting for comparative analysis

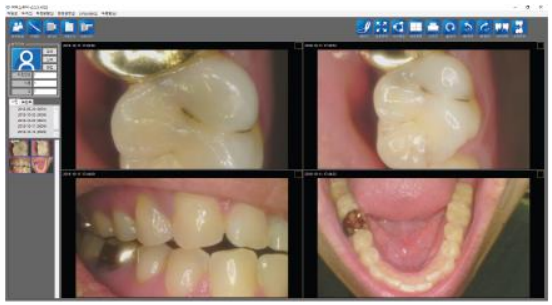
Multi Shot Mode

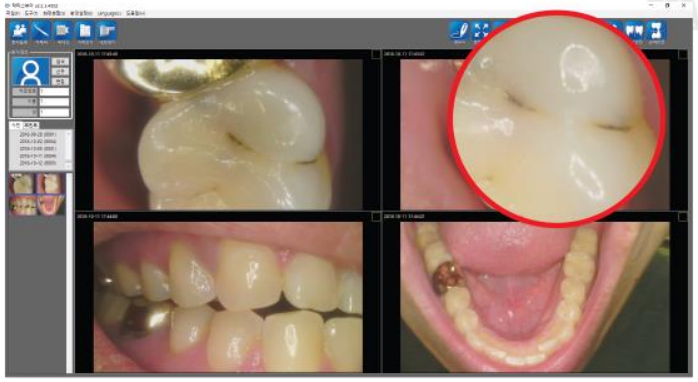


Other features

Zoom function

Ability to enlarge the image with zoom feature to support user convenience.





* Need to install "Zoom function" program on the PC.

Software compatibility

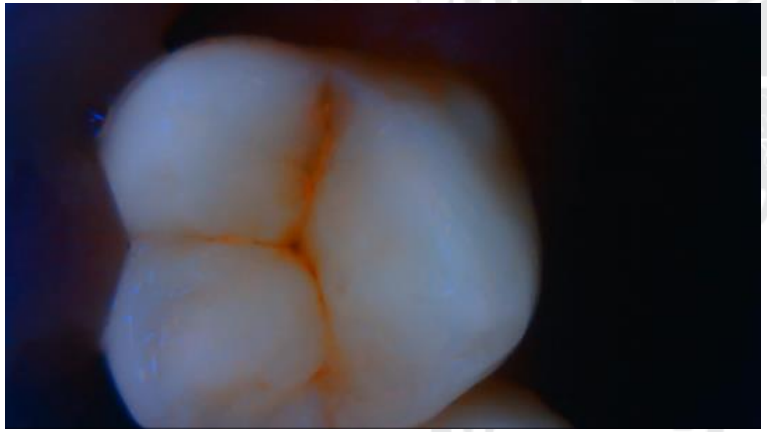
Able to be used with almost any dental imaging software in the market.

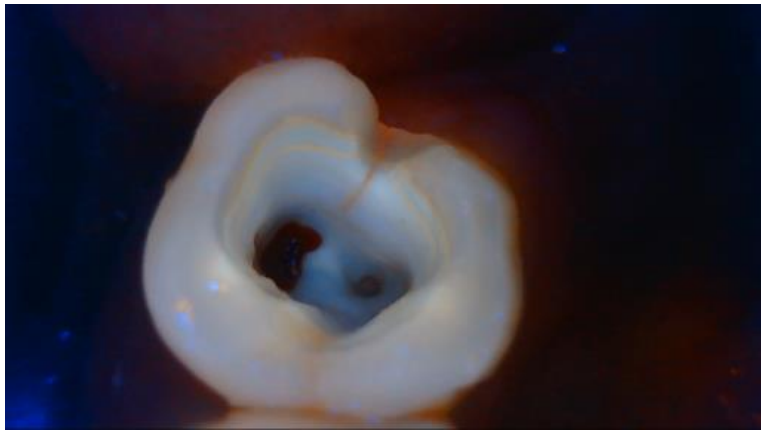
Wireless Pack

- The optional wireless pack enables the product to be converted into the only wireless disease detection product on the market
- It can be supplied option to wired products or as a entire wireless product
- The wireless technology applied to the product is a proven technology that we have used over the years

Case

Crack





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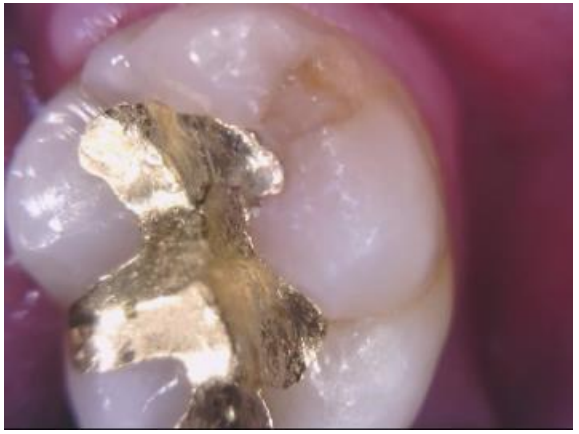

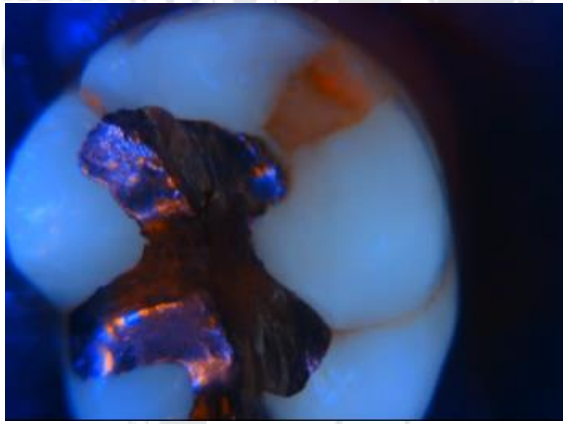

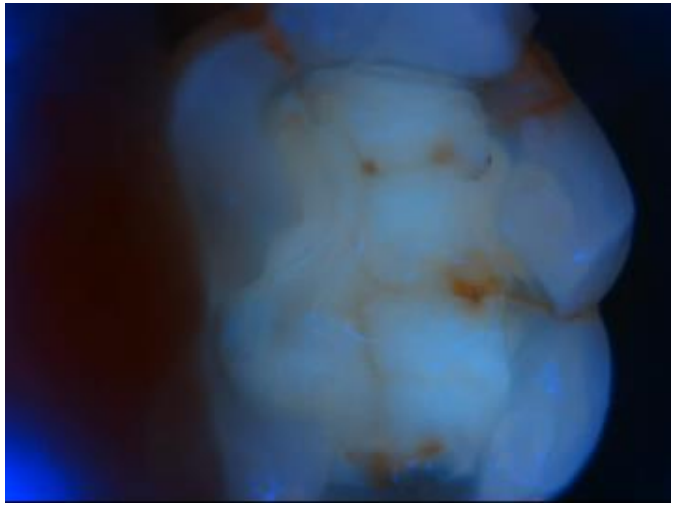

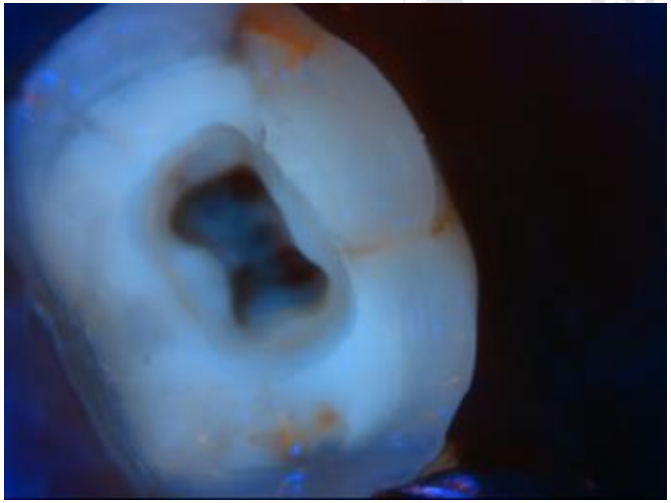

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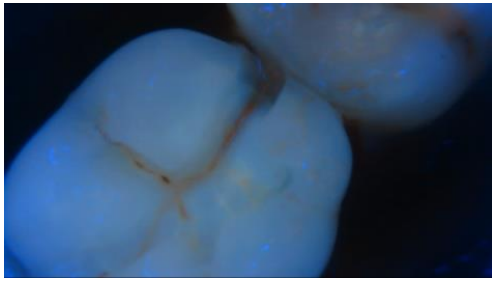

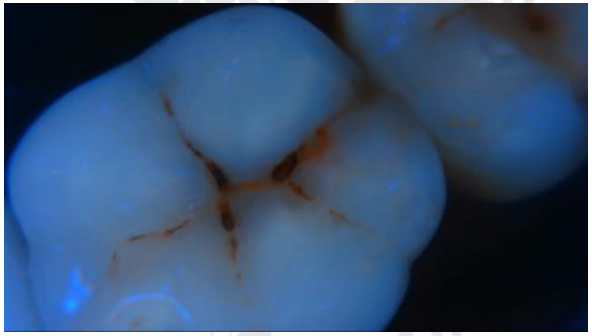

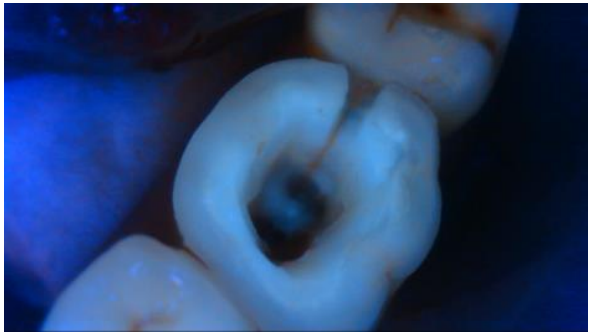

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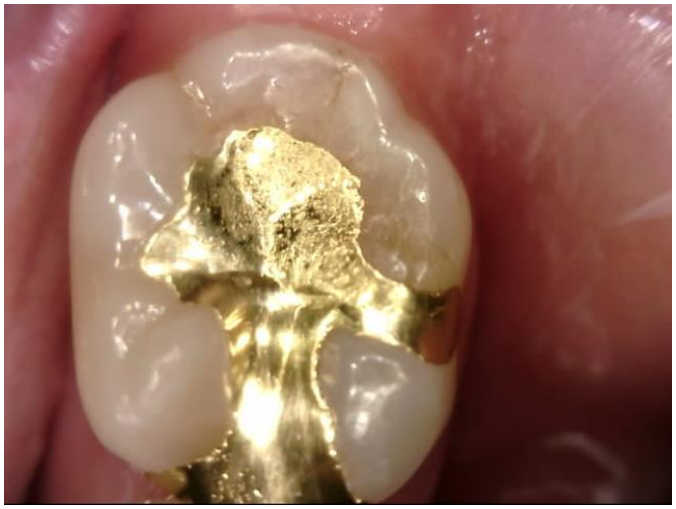

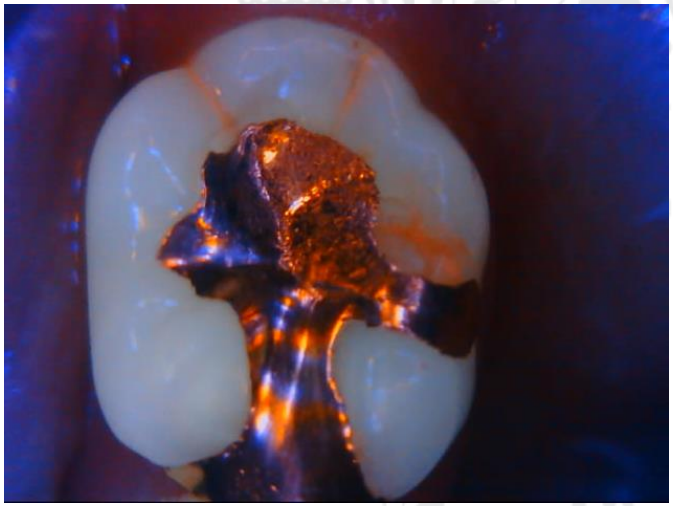

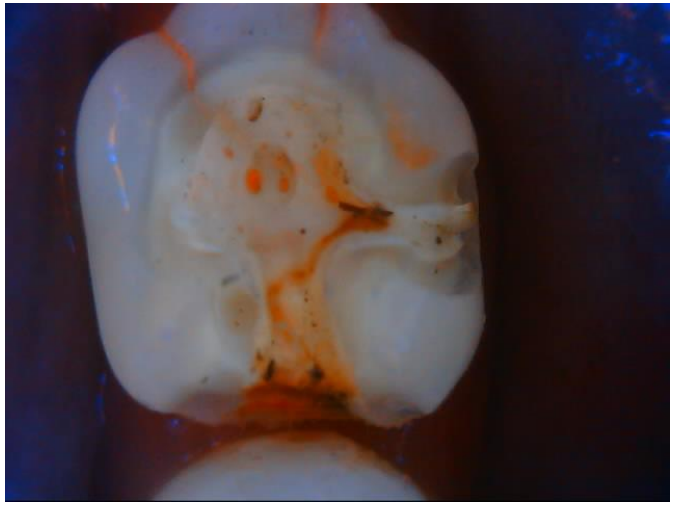

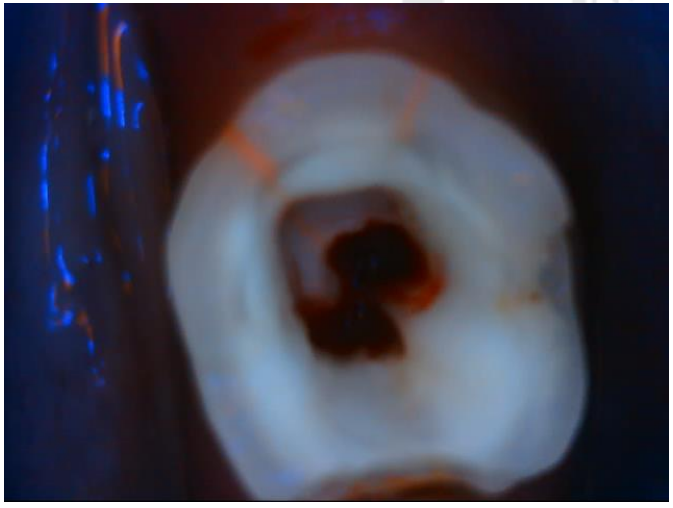

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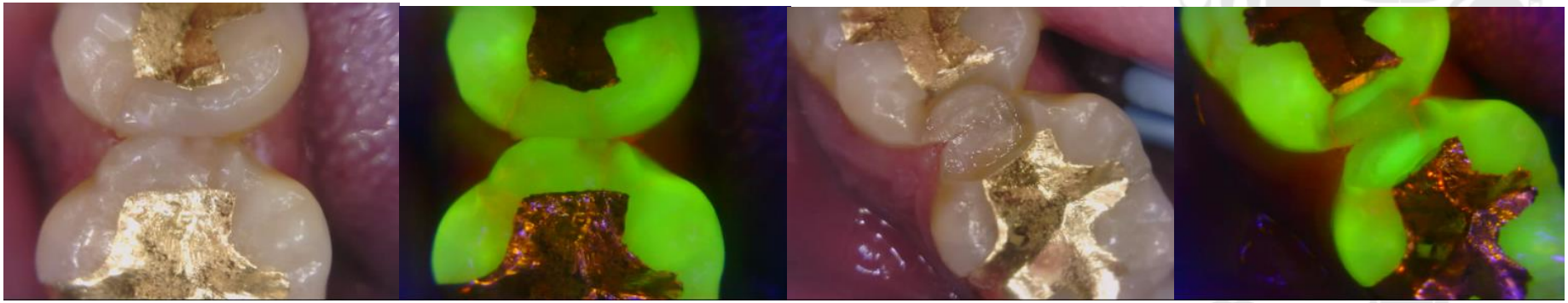

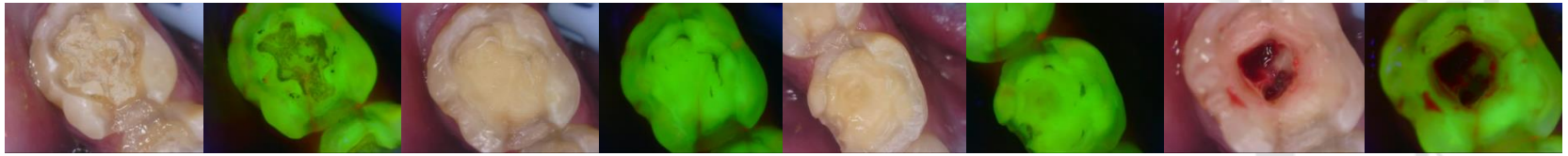

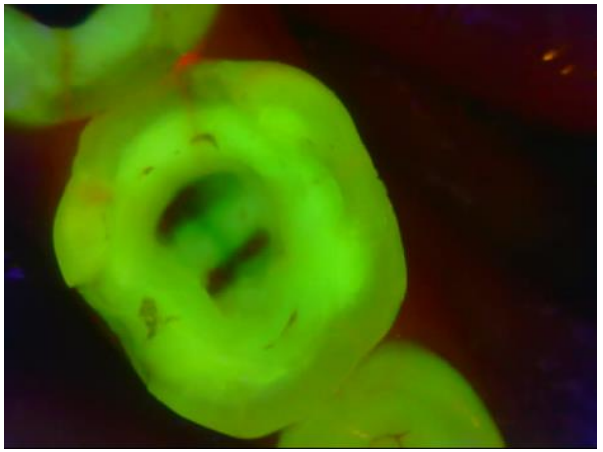

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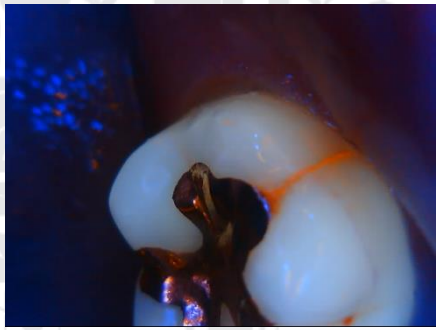

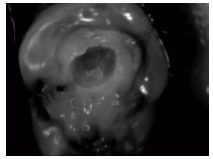
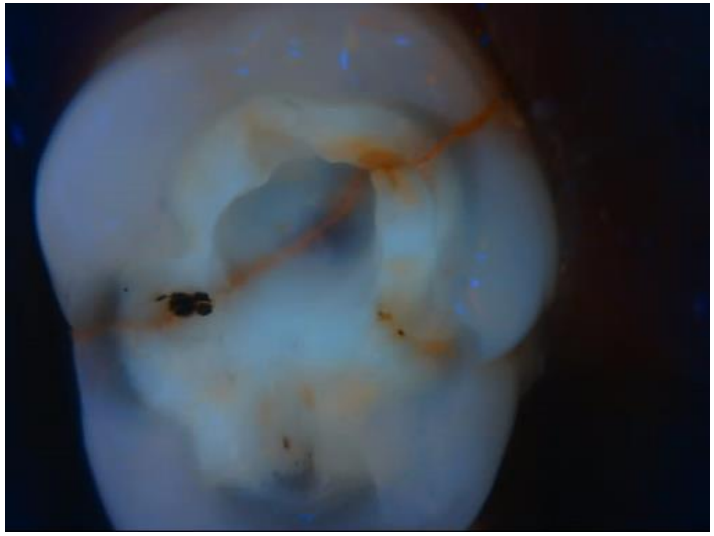
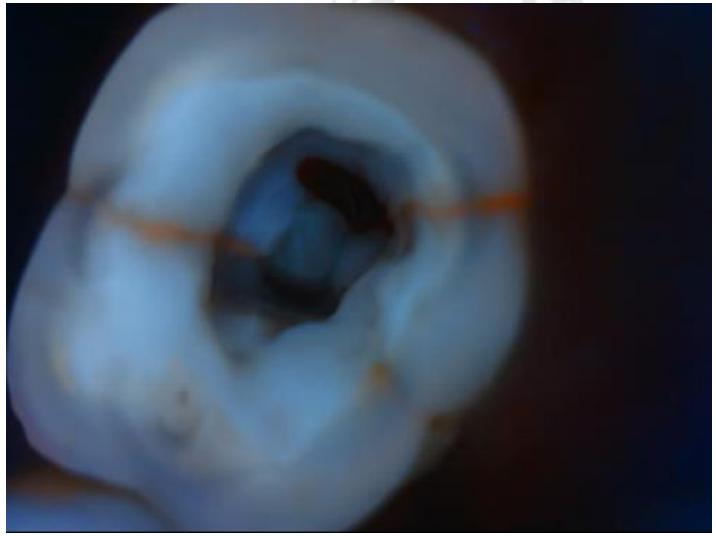

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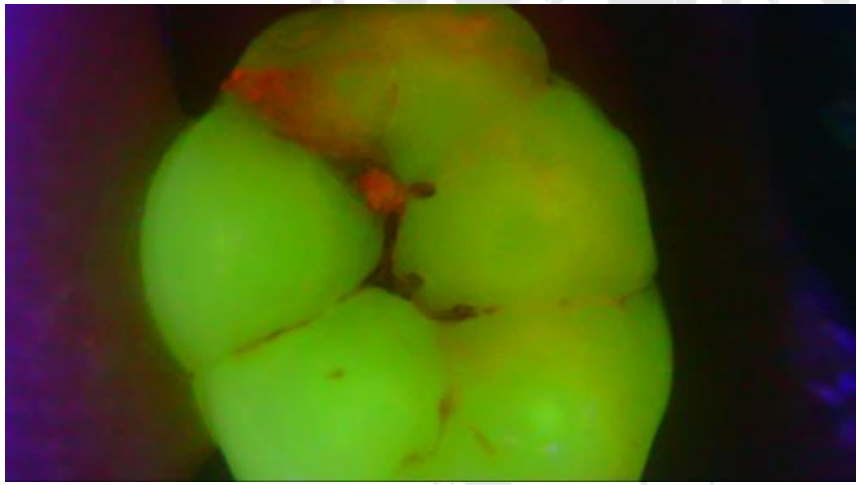
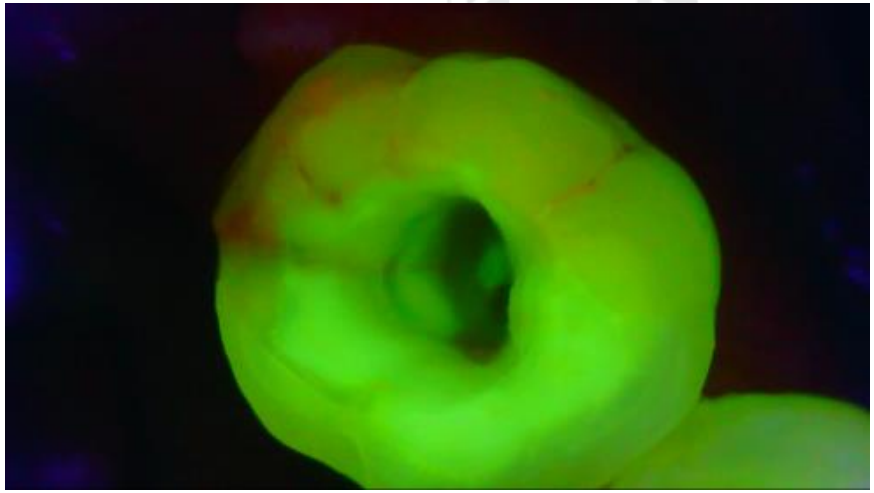
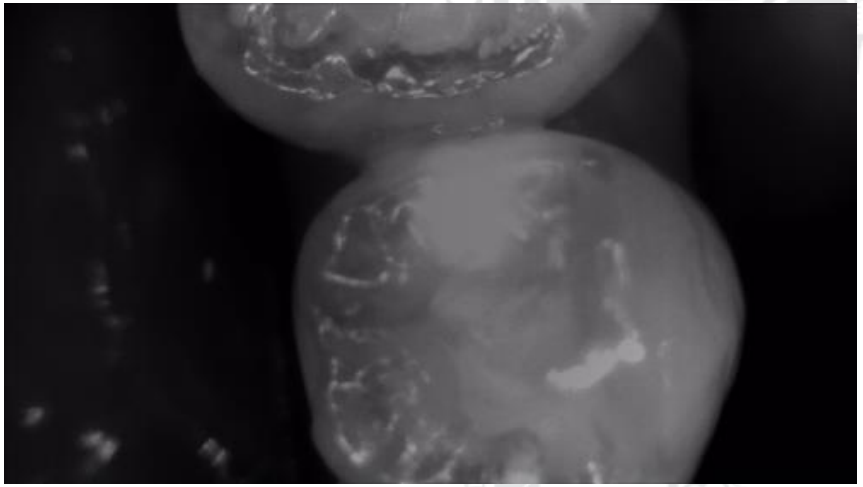
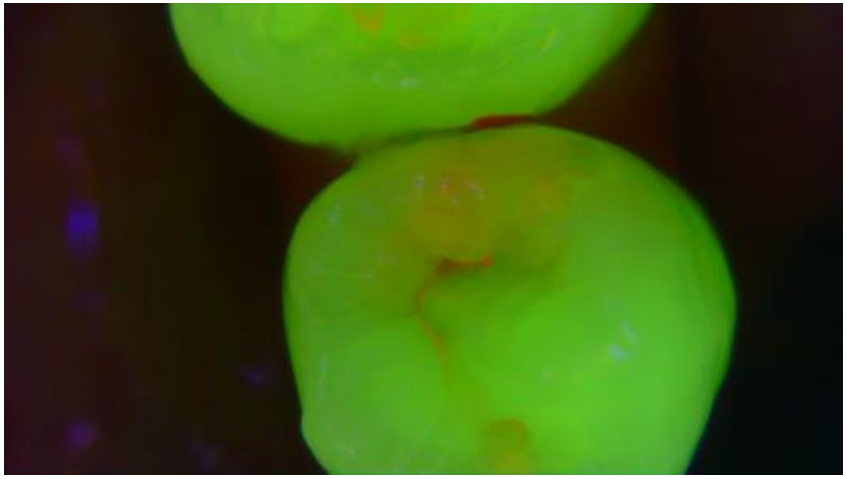




Proximal





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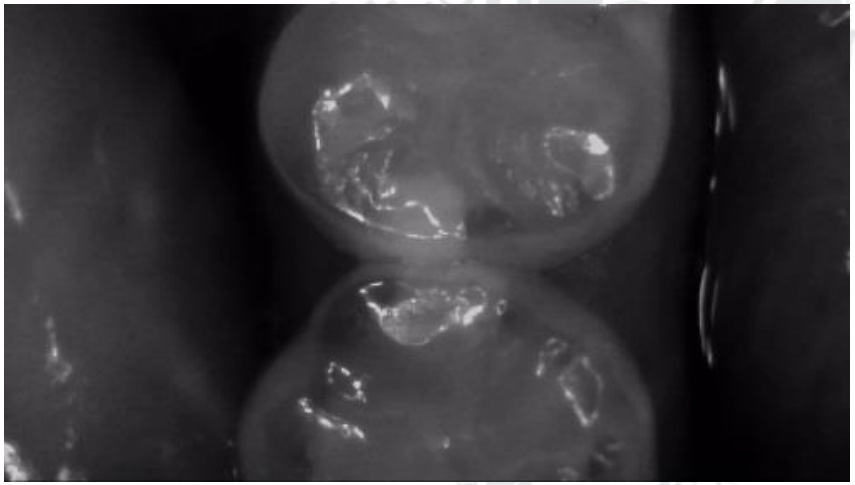

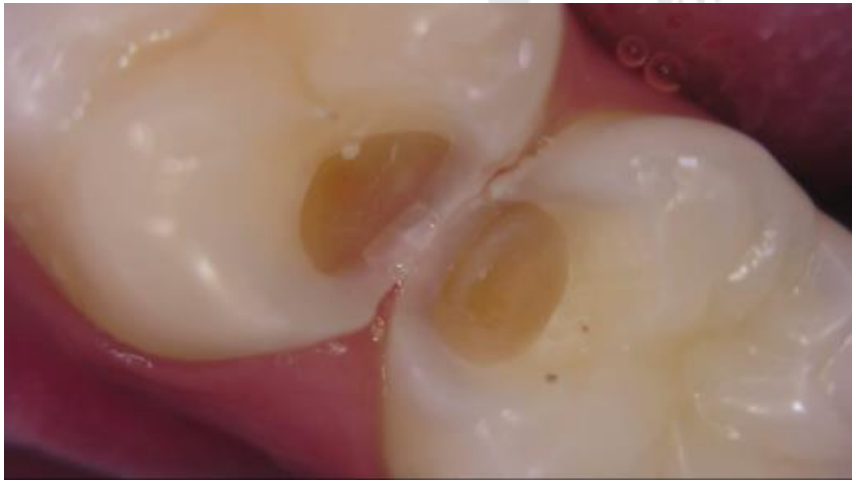

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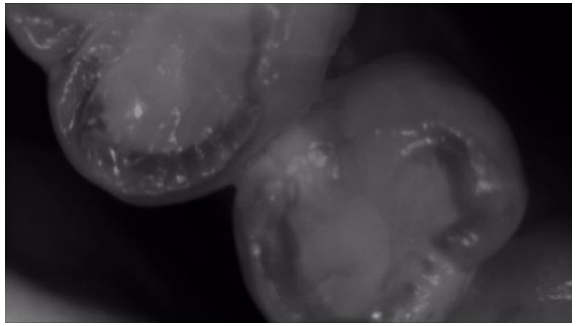
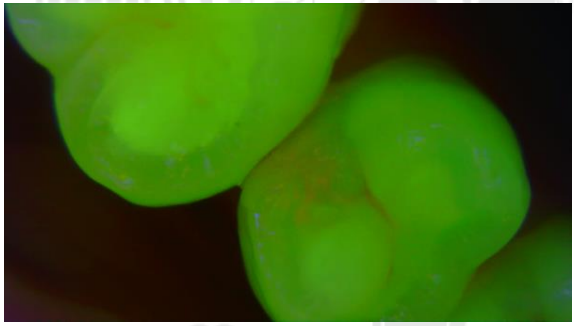

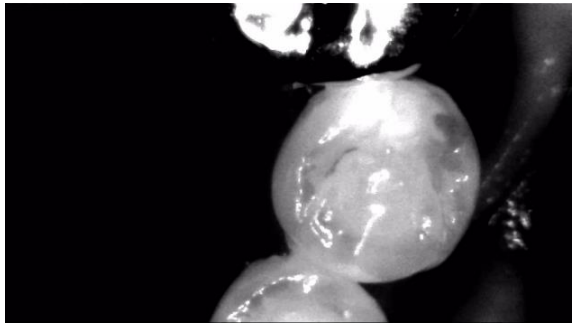
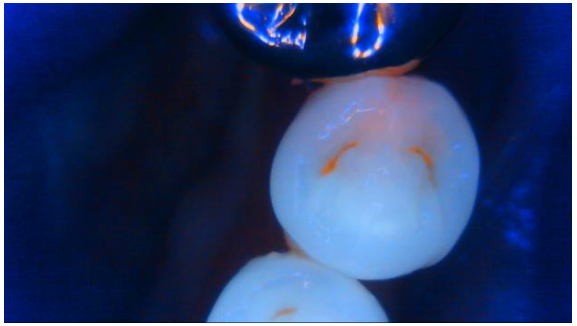

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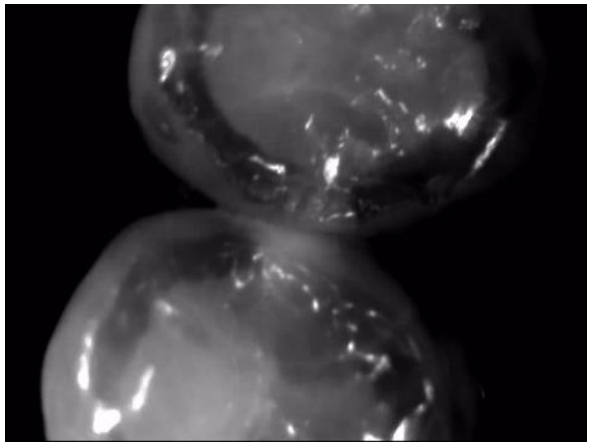
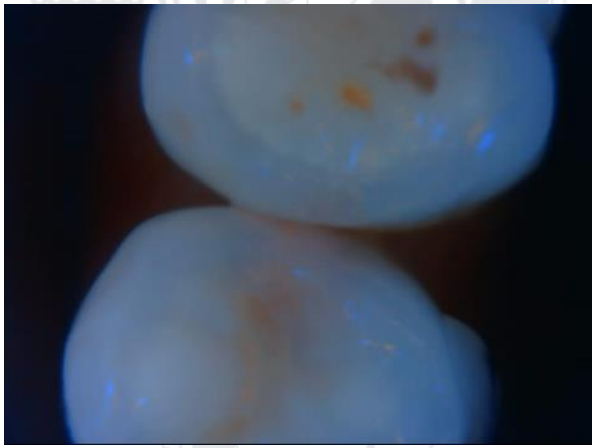

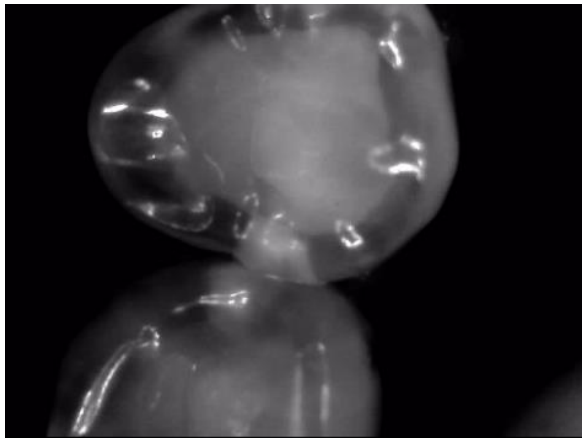
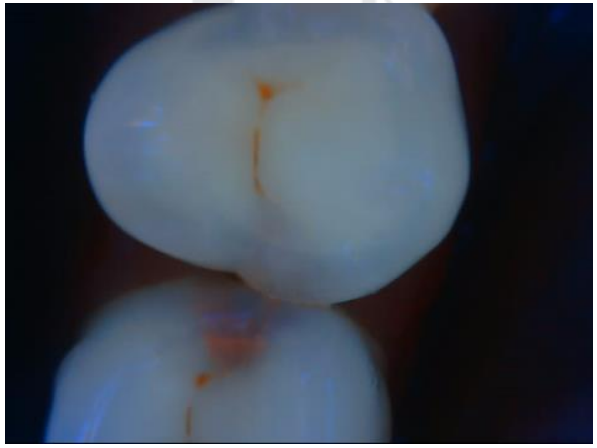

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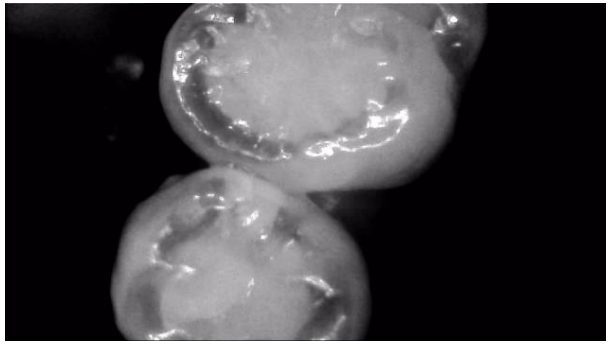
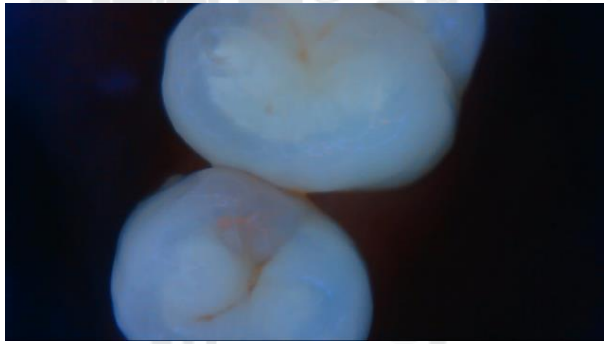

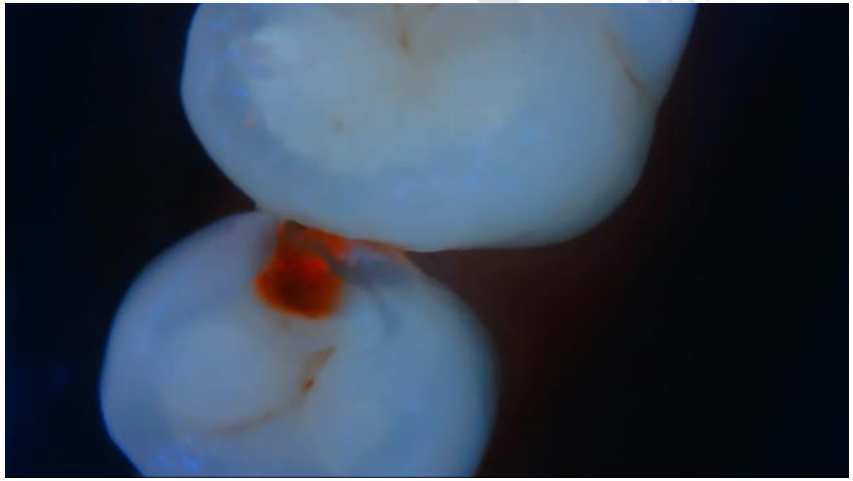

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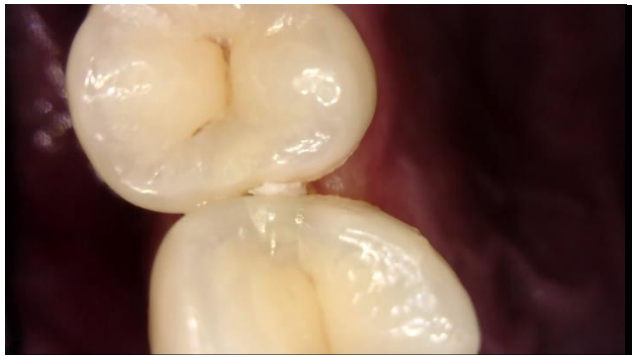
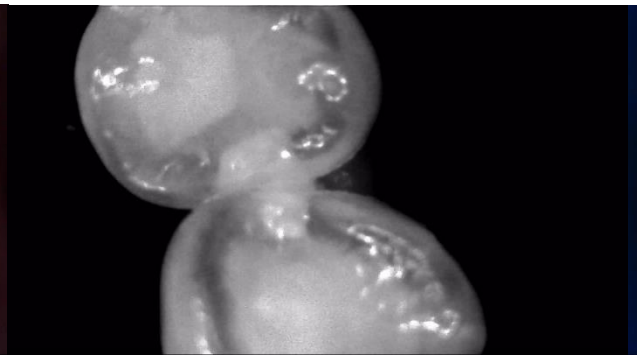
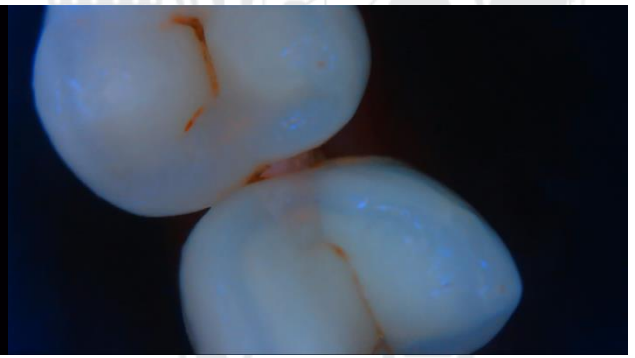


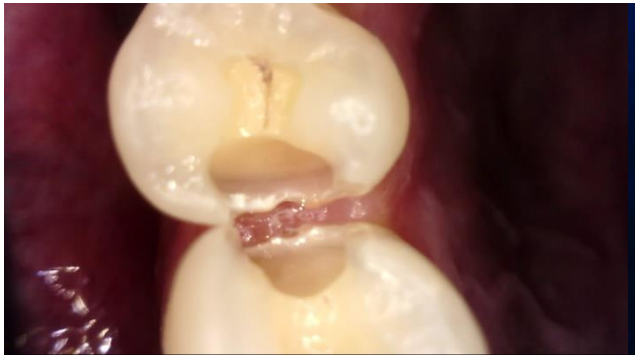
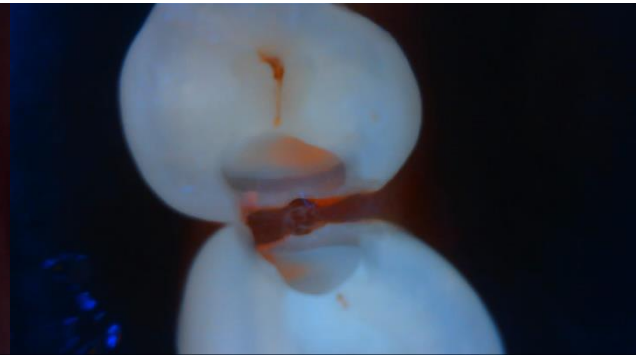

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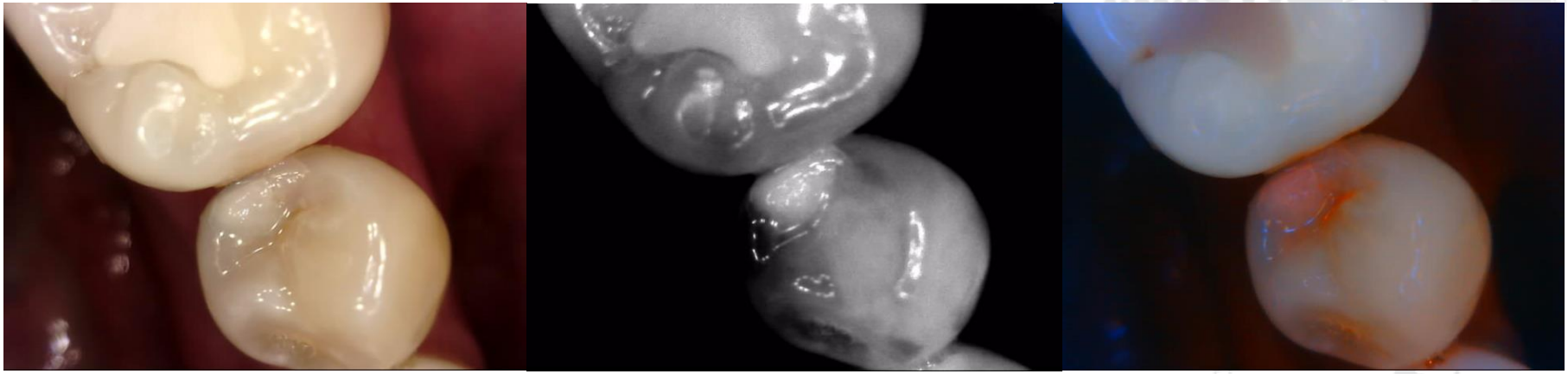

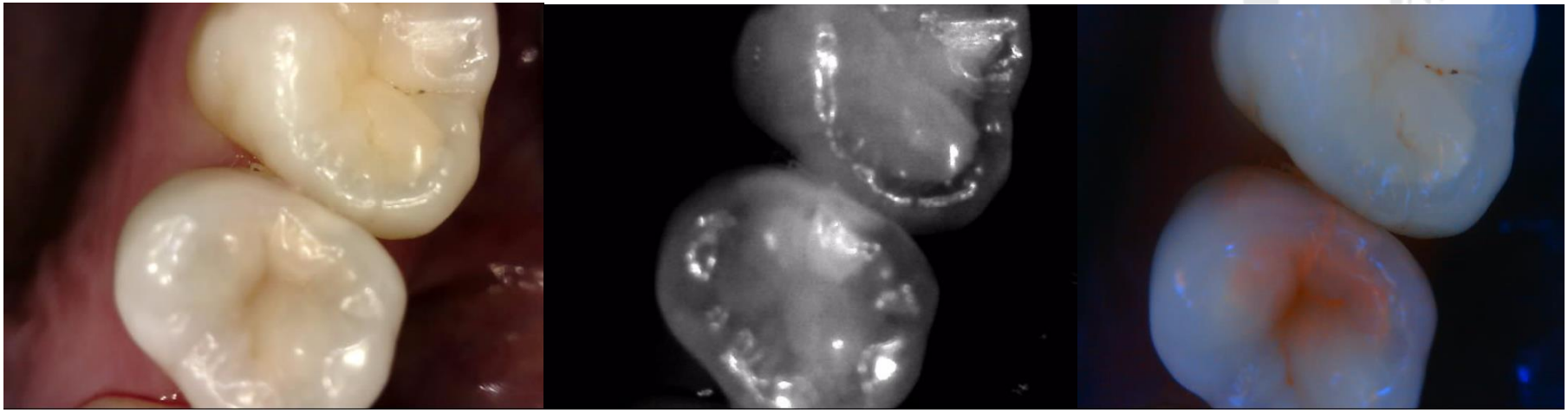

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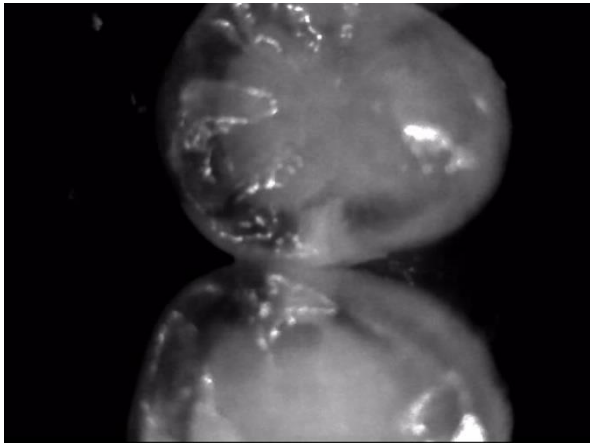
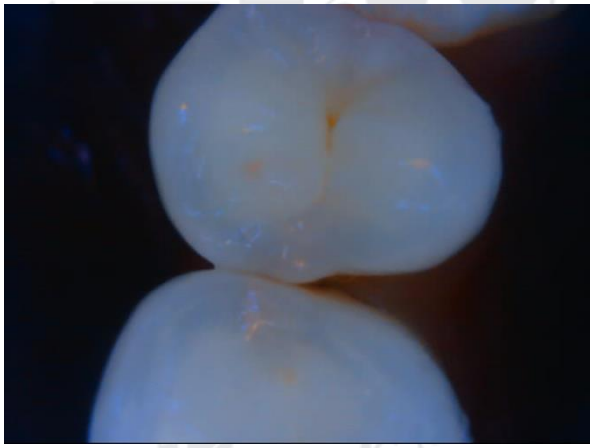

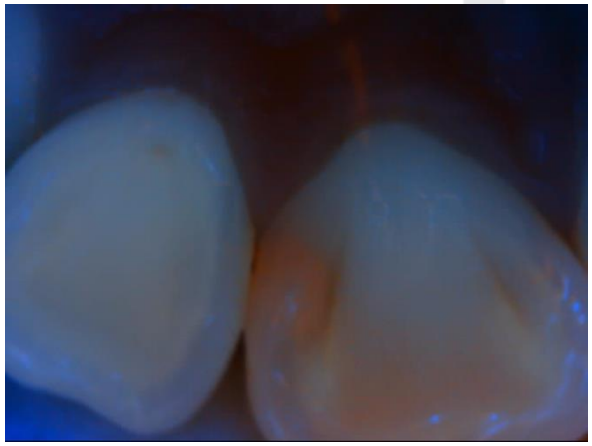

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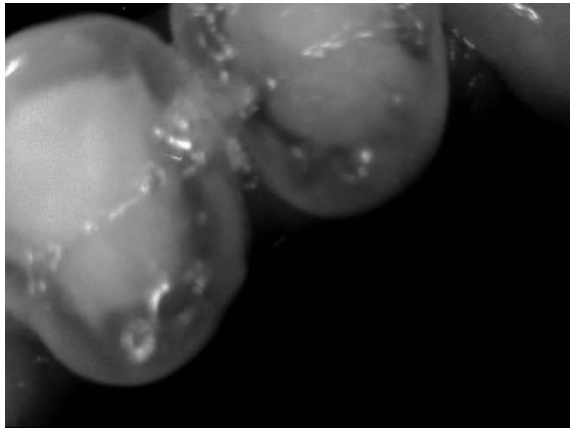
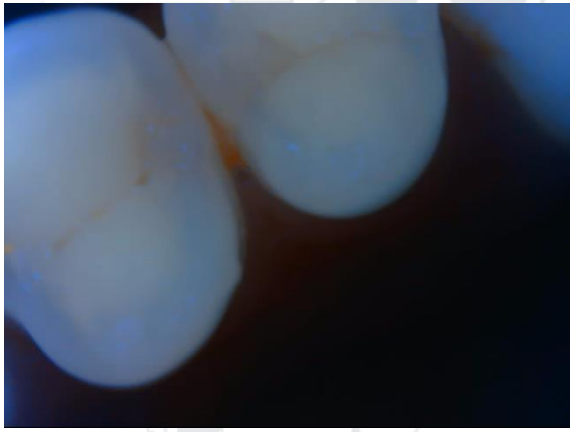
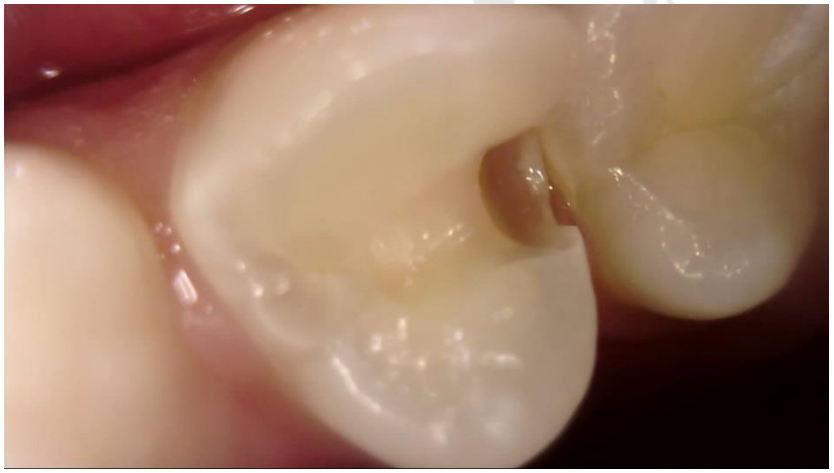
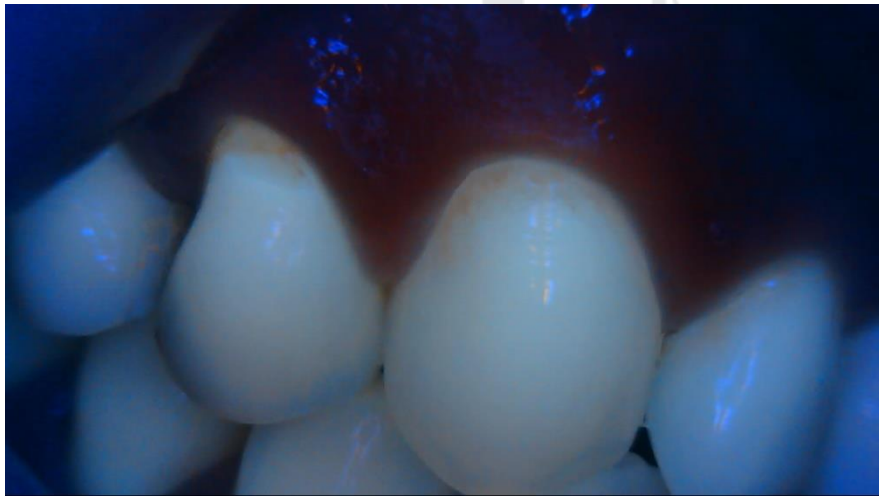





Early Caries (White Spot)

Early Caries (White Spot)



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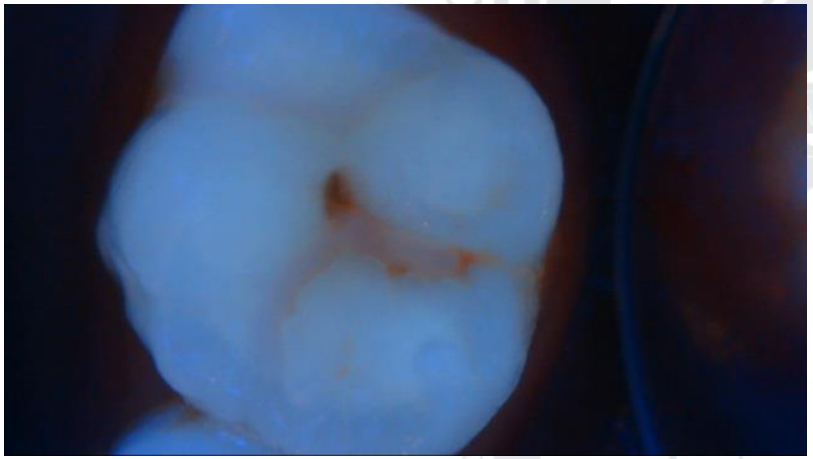

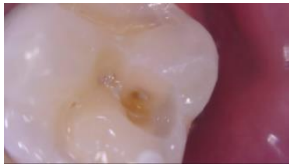

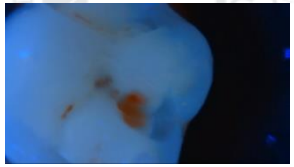

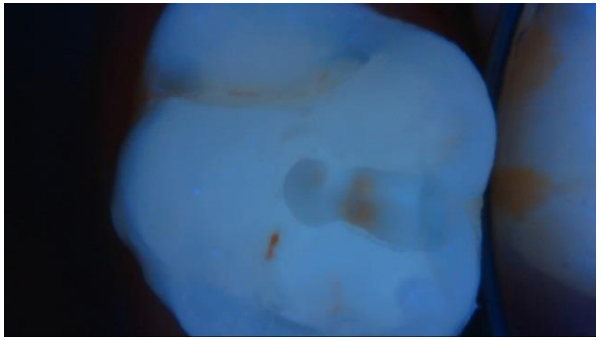

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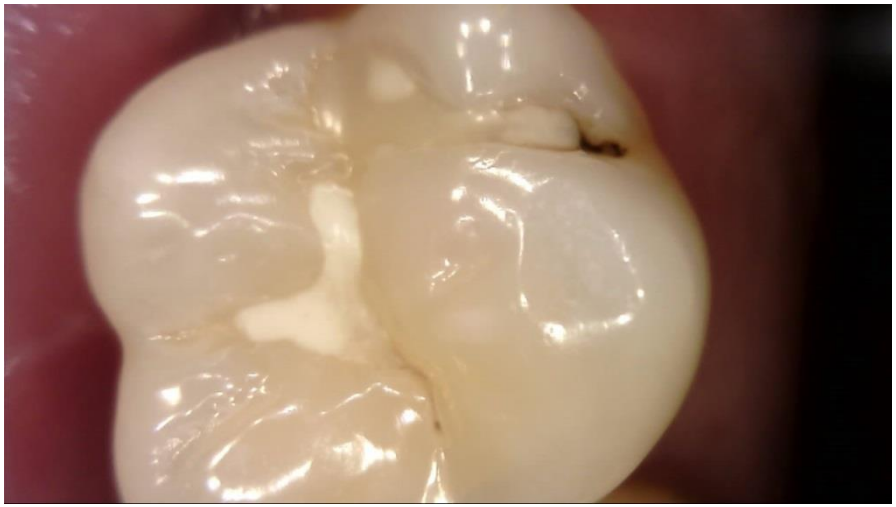

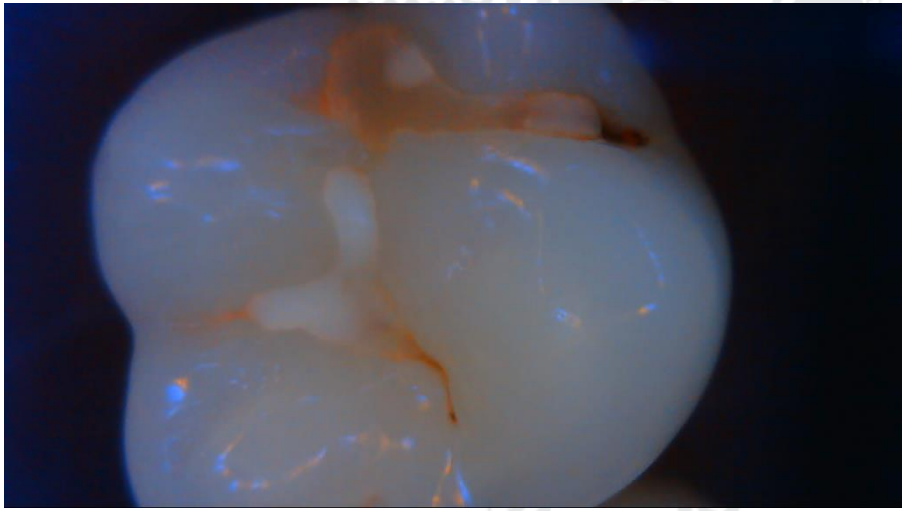

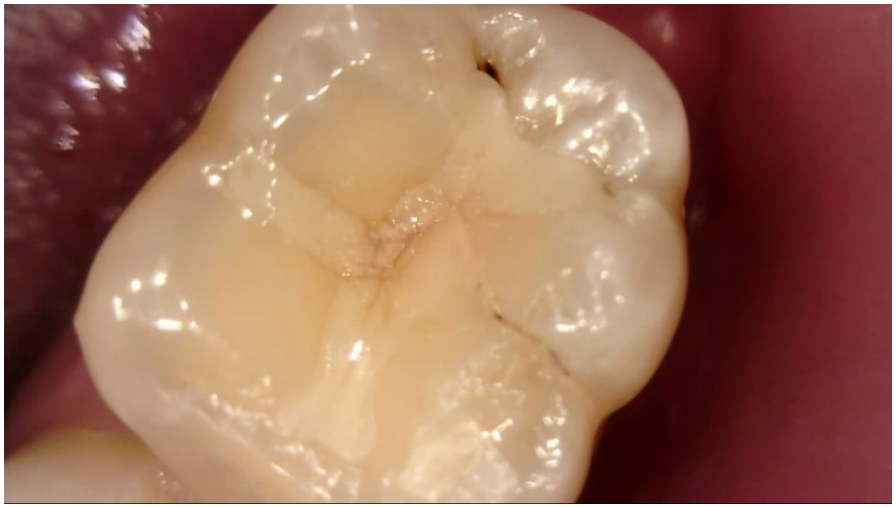

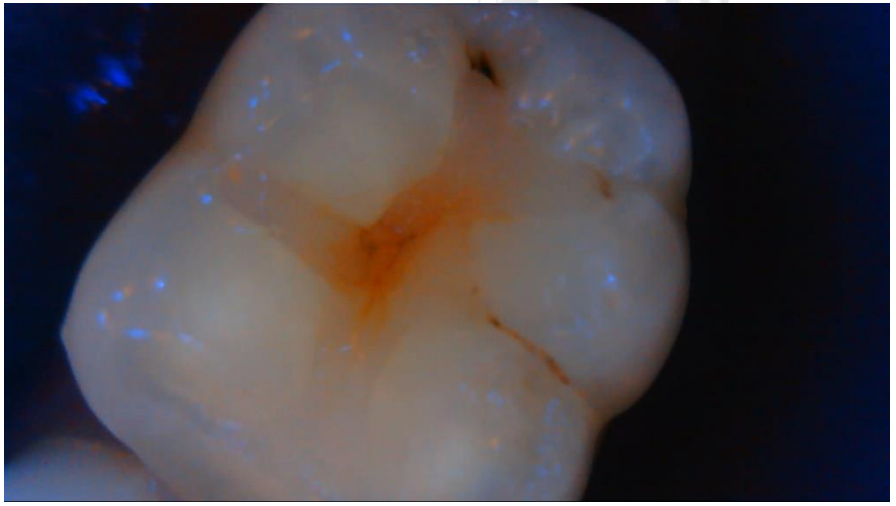

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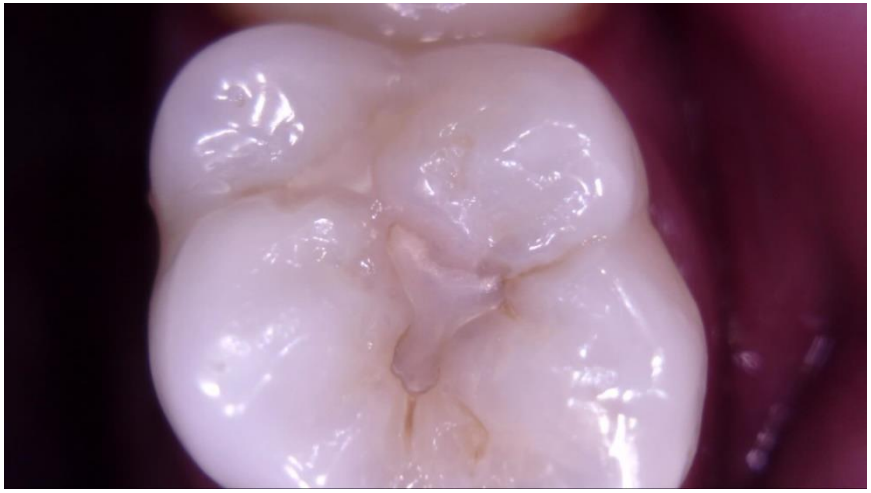
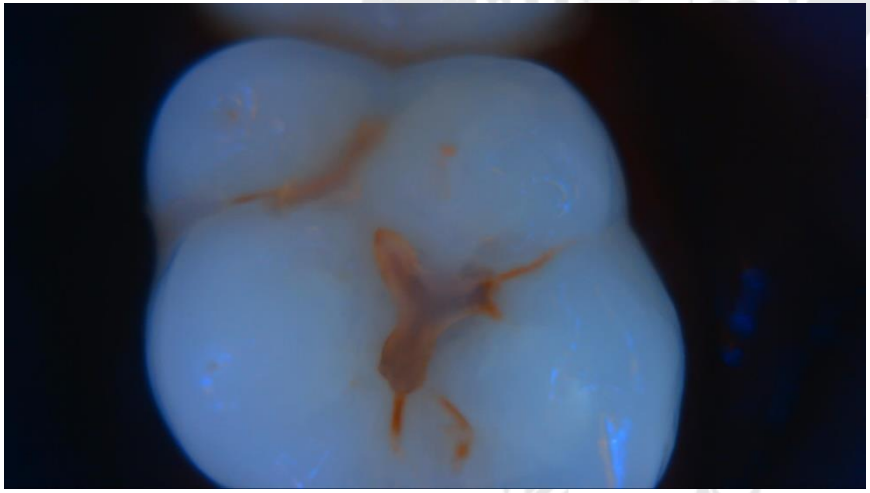

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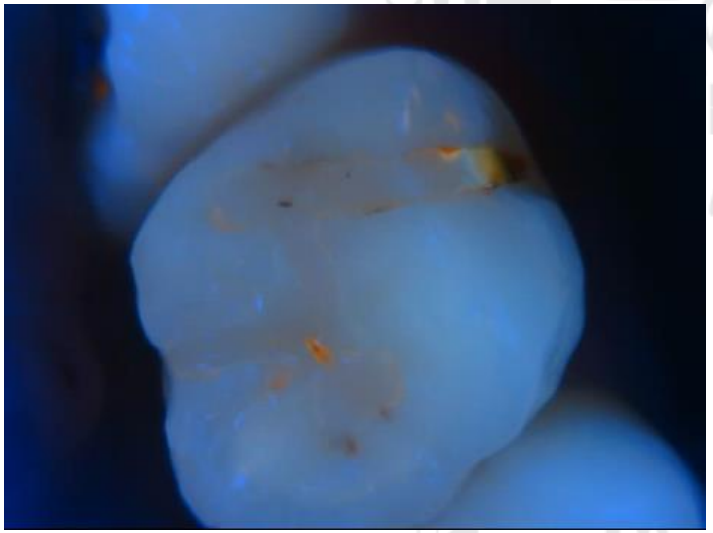

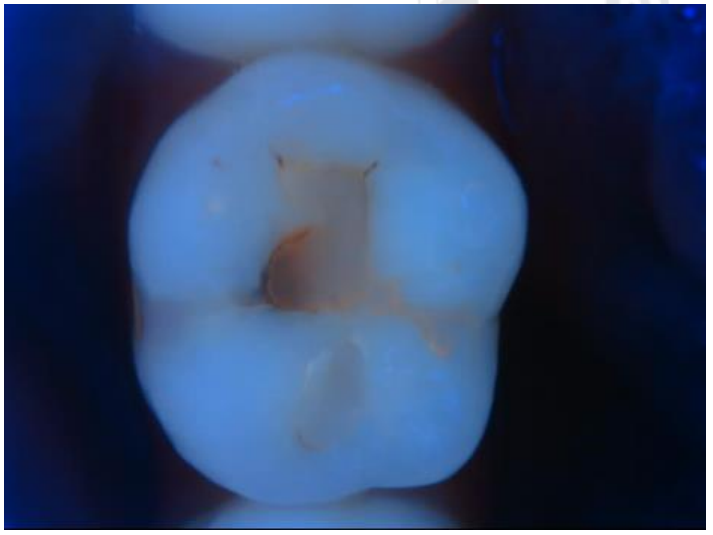

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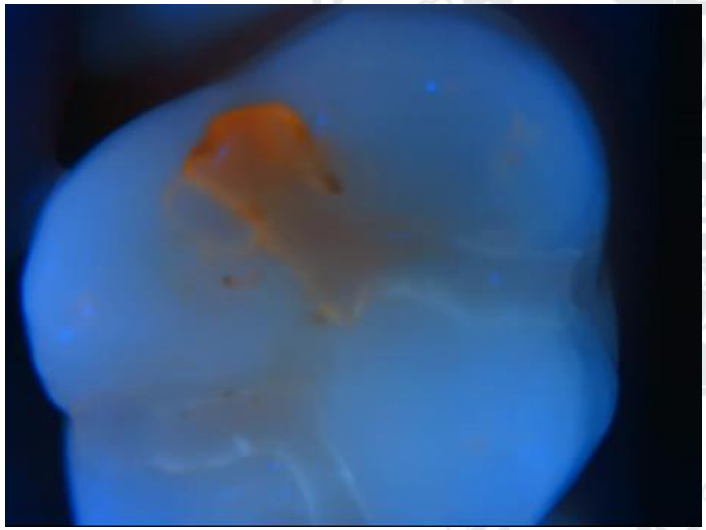

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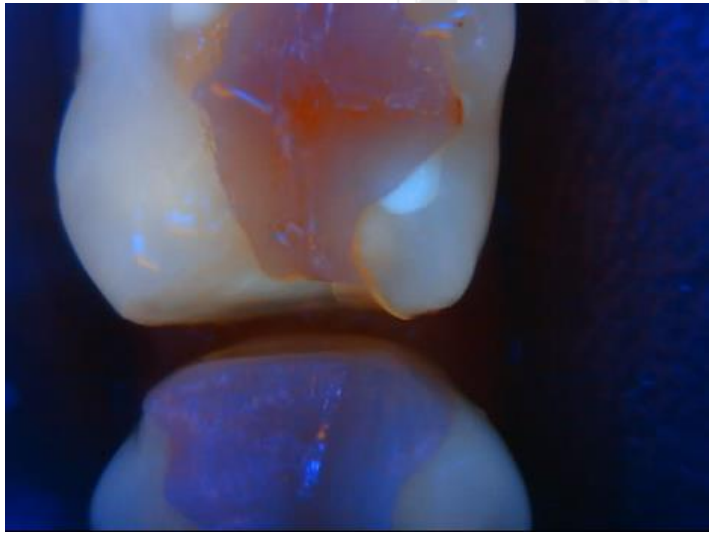

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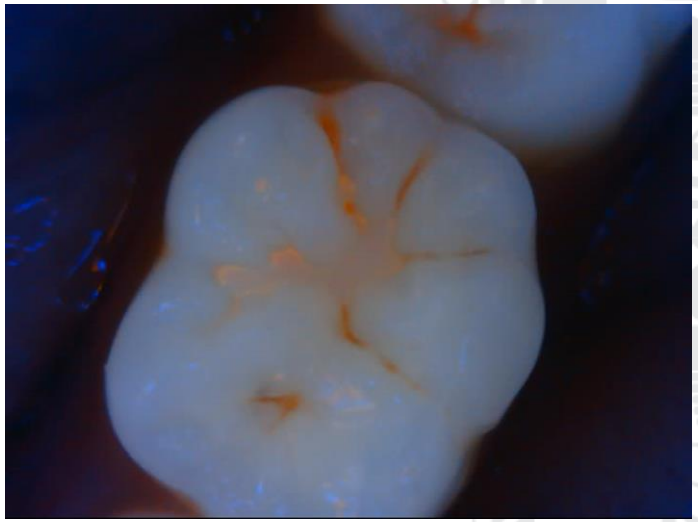

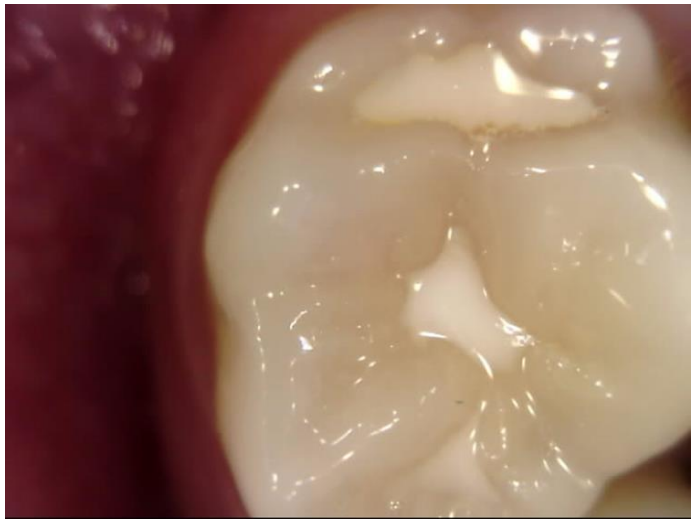

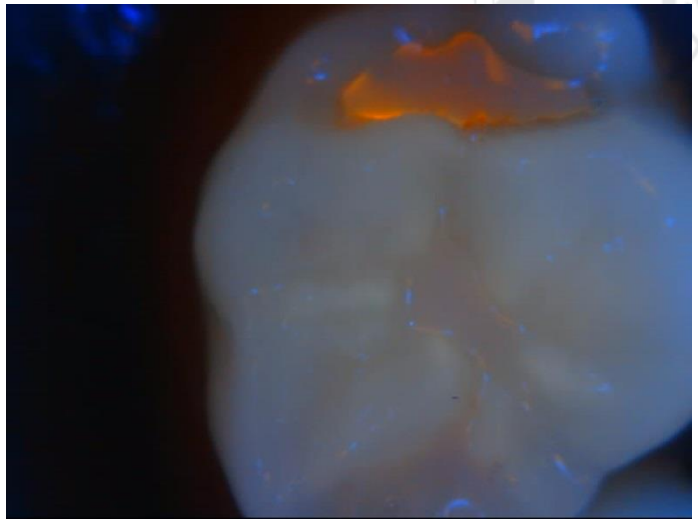

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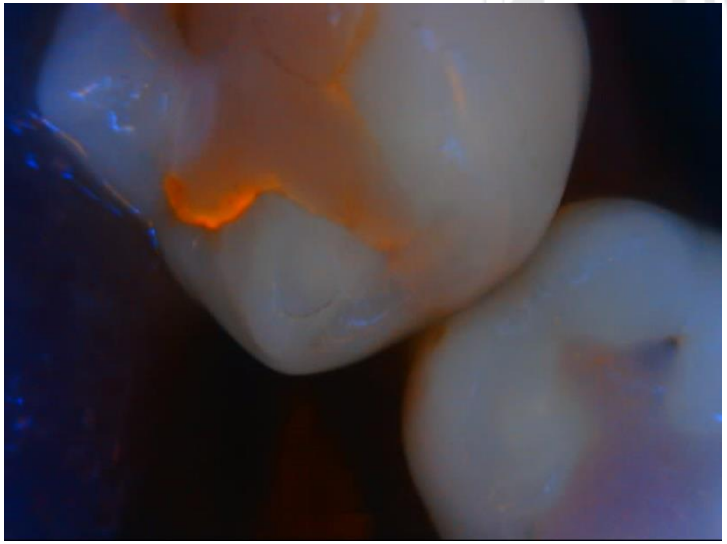
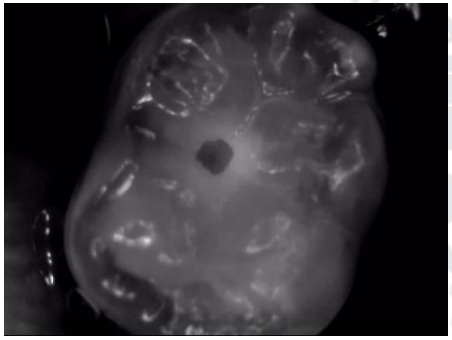
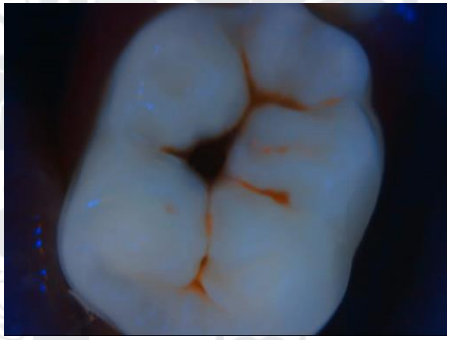


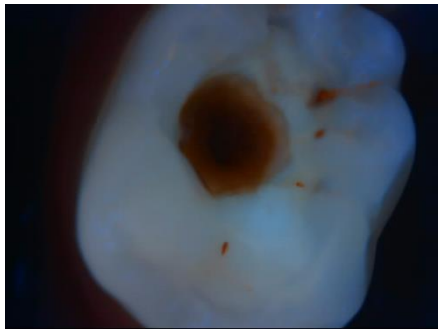
Inlay Leaving Out

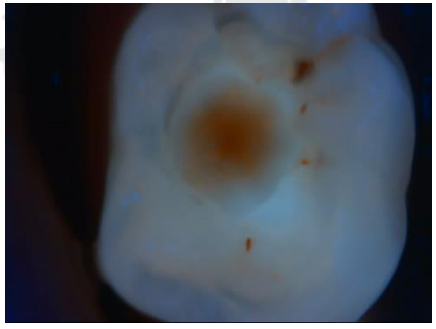
Prosthodontic

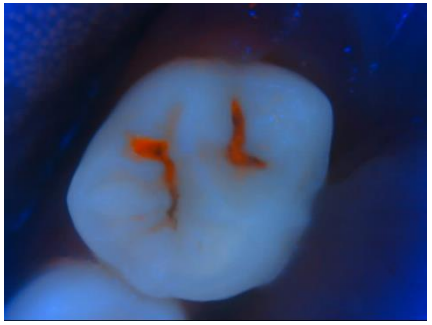
Occlusal

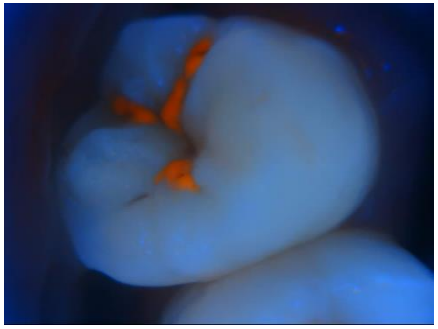










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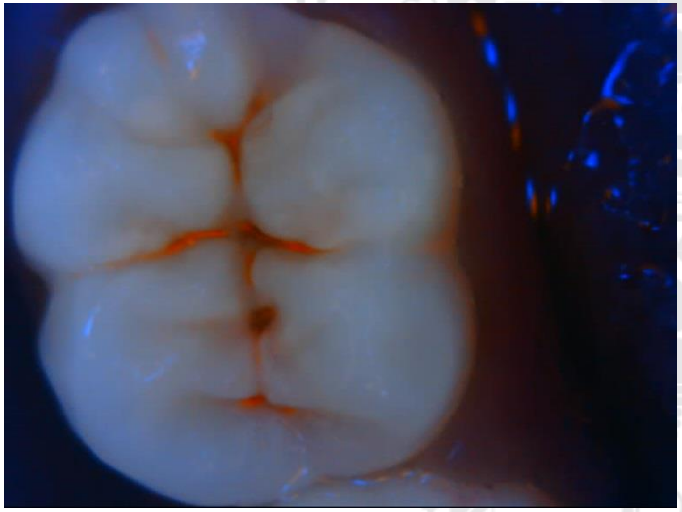

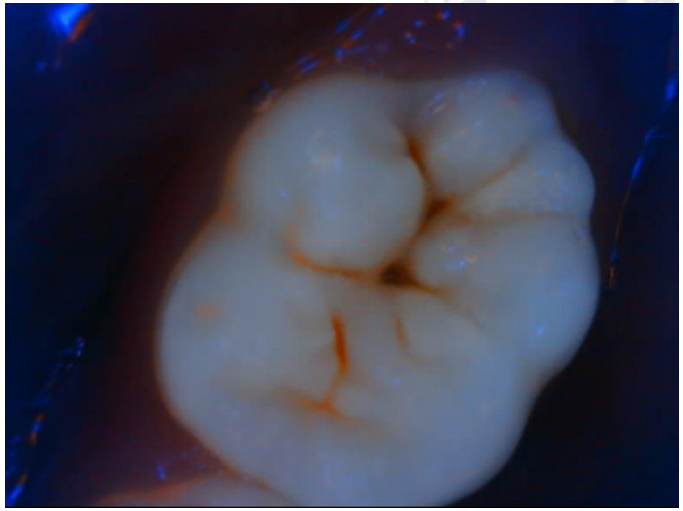

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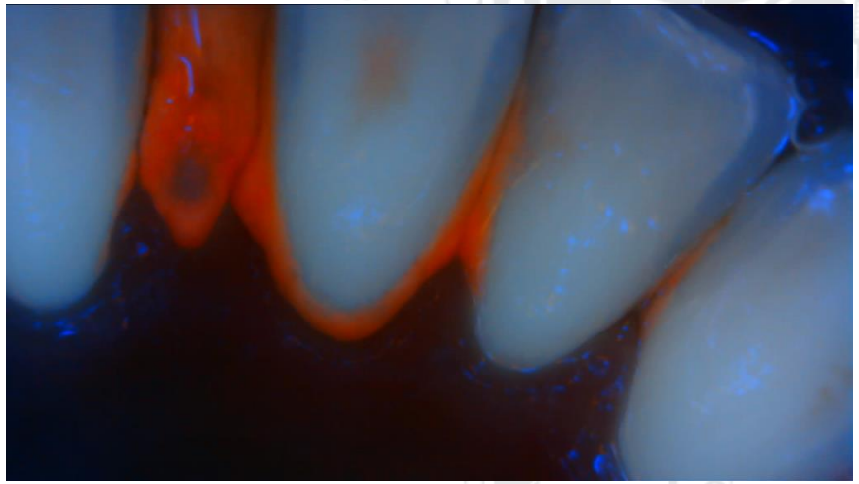

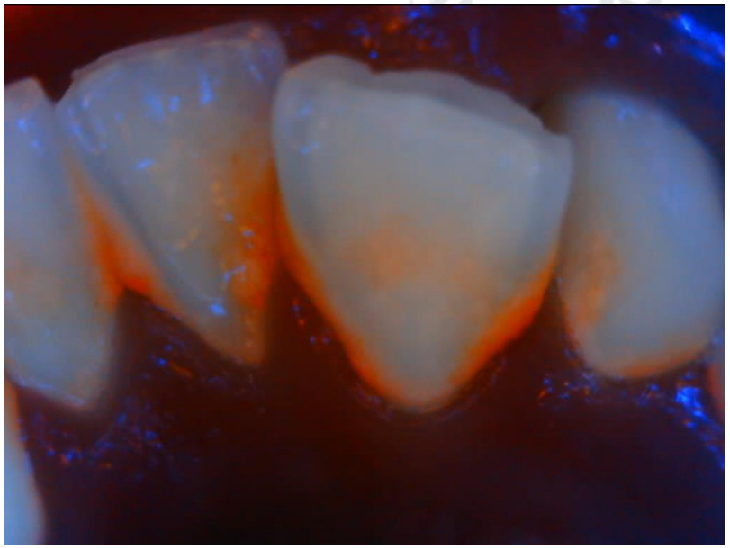

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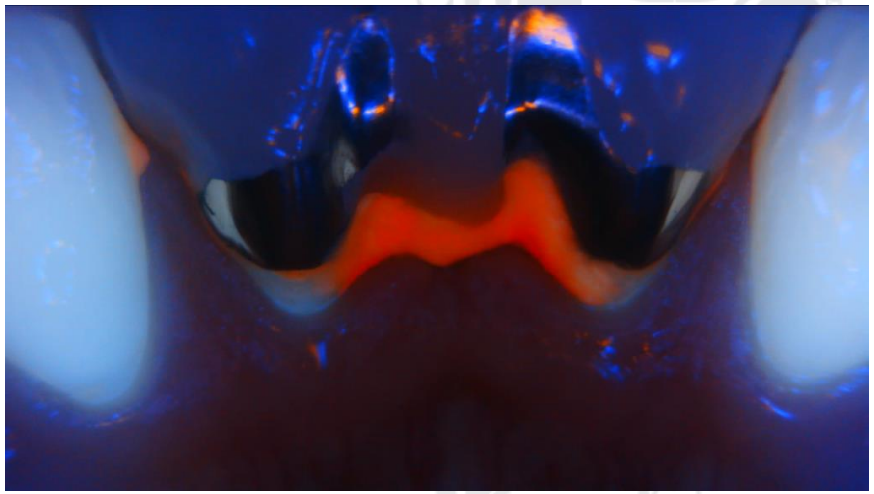

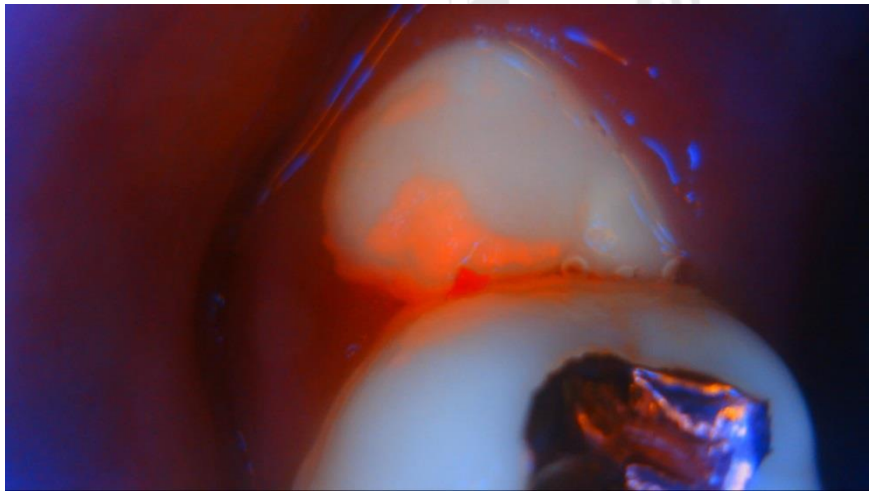

Patents

Name of Patent : Complex imaging apparatus for medical treatment

특허증
CERTIFICATE OF PATENT

특허 Patent Number 제 10-1979311 호
출원번호 Application Number 제 10-2017-0096008 호
출원일 Filing Date 2017년 07월 28일
등록일 Registration Date 2019년 05월 10일

발명의 명칭 Title of the Invention
의료용 복합촬영장치

특허권자 Patentee
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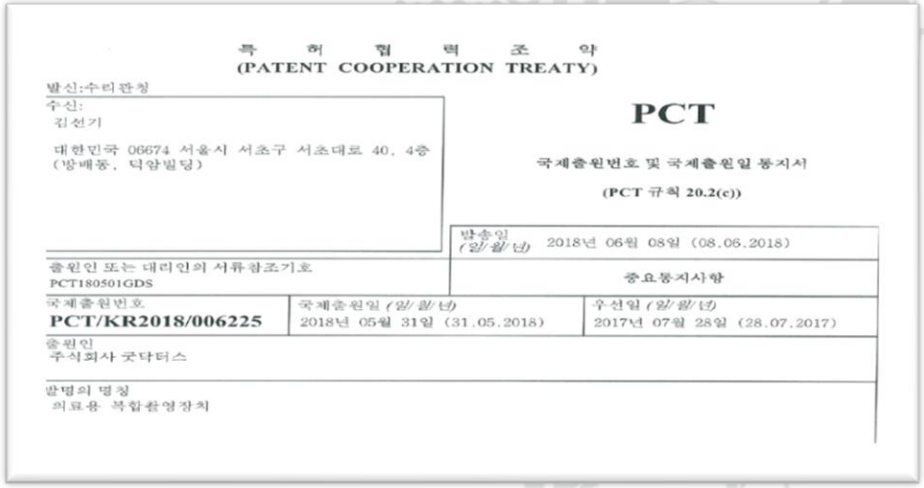
위의 발명은 「특허법」에 따라 특허등록원부에 등록되었음을 증명합니다.
This is to certify that, in accordance with the Patent Act, a patent for the invention has been registered at the Korean Intellectual Property Office.

2019년 05월 10일

특허청
Korean Intellectual Property Office

QR코드로 현재기준 등록사항을 확인하세요

특허청장
COMMISSIONER,
KOREAN INTELLECTUAL PROPERTY OFFICE
박 원주



특 허 협 력 조 약
(PATENT COOPERATION TREATY)

PCT

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국제출원번호 및 국제출원일 통지서
(PCT 규칙 20.2(c))

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중요통지사항

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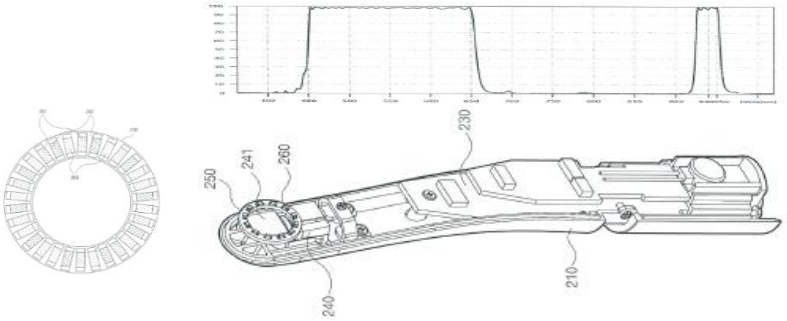
PCT/KR2018/006225	2018년 05월 31일 (31.05.2018)	2017년 07월 28일 (28.07.2017)

출원인
주식회사 굿닥터스

발명의 명칭
의료용 복합촬영장치

본 발명에 의한 의료용 복합촬영장치는, 치아 이미지를 촬영을 위한 이미지센서를 구비하는 카메라유닛과, 상기 카메라유닛의 동작제어 및 신호전달을 위한 피씨비기판과, 상기 카메라유닛이 촬영하는 치아를 향해 발광하는 복수의 광원이 실장된 광원패널과, 상기 카메라유닛과 상기 피씨비기판과 상기 광원패널이 내장되는 상부하우징 및 하부하우징으로 구성되는 헤드부; 신호 입력을 위한 조작패널이 구비되며, 상기 헤드부로 전력을 공급하고, 상기 헤드부로부터 전달받은 치아 이미지 신호를 외부로 전송하는 본체부;를 포함한다.



Name of Patent : Multi-camera for medical treatment

특허증
CERTIFICATE OF PATENT

특허 Patent Number 제 10-1618684 호

출원번호 Application Number 제 10-2014-0135994 호
출원일 Filing Date 2014년 10월 08일
등록일 Registration Date 2016년 04월 29일

발명의 명칭 Title of the Invention
다목적 의료용 카메라 장치

특허권자 Patentee
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This is to certify that, in accordance with the Patent Act, a patent for the invention has been registered at the Korean Intellectual Property Office.

2016년 04월 29일

특허청장
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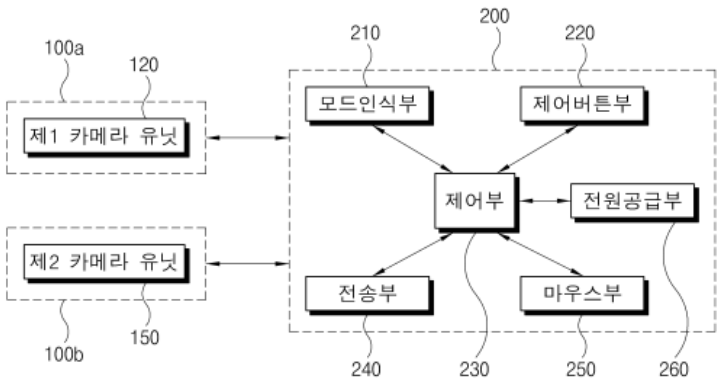
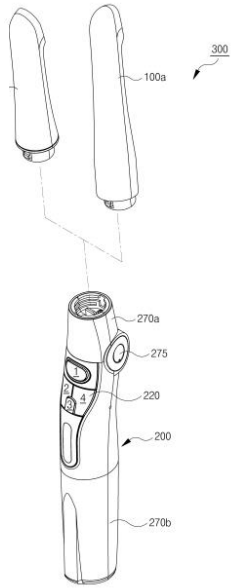
최 동 규

본 발명은 다목적 의료용 카메라 장치에 관한 것으로, 본 발명에 따른 구강내부의 치아이미지 촬영 및 치아우식 탐지가 가능한 의료용 카메라 장치는, 육안 판별을 위해 치아의 외형 이미지를 촬영하기 위한 제1카메라 유닛이 내장된 제1헤드부와; 특정파장대의 광을 발생하여 치아에 조사하는 광원과, 상기 광원이 조사된 치아의 이미지를 촬영하기 위한 이미지 센서를 구비하는 제2카메라 유닛이 내장되어, 치아의 우식여부의 판별을 위한 이미지를 제공하는 제2헤드부와; 상기 제1헤드부가 결합됨에 의해 인식되는 제1모드에서는 상기 제1이미지 센서를 통해 촬영된 치아의 외형이미지를 유무선 통신을 통해 연결된 PC로 전송하고, 상기 제2헤드부가 결합됨에 의해 인식되는 제2모드에서는 상기 광원과 상기 제2이미지센서를 제어하여 치아형광 또는 치아투사에 따른 이미지를 촬영하여 치아의 우식여부 판단을 위한 영상분석 프로그램이 내장된 상기 PC에 전송하고, 상기 제1모드 또는 상기 제2모드 전후에 선택되는 제3모드에서는 내장된 자이로 센서를 이용한 자이로 마우스 기능을 수행하여 상기 PC를 제어하는 본체를 구비한다.





Thank you

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