

Image Atlas

Image Atlas

edited by :

Takashi Akasaka (Wakayama Medical University)

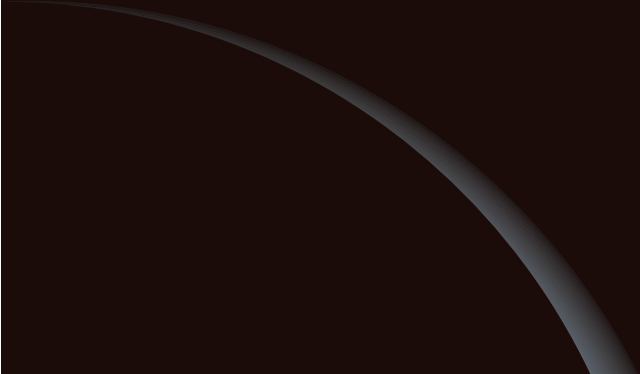
Yoshihiro Morino (Iwate Medical University)

Gaku Nakazawa (Tokai University)

FD-OCT (Fourier Domain Optical Coherence Tomography: フーリエ領域光干渉断層撮影) の登場により、病理レベルに近い高解像度断層画像をより簡便な手技で取得することが可能となった。IVUS (Intravascular ultrasound: 血管内超音波法) とは異なる視点で病変部を観察することが出来るこのイメージングモダリティは臨床においてはまだ新しく、治療への貢献度は未知数である。本書はOFDI (Optical Frequency Domain Imaging) 画像で一般的に見られる所見から、判別困難と考えられる所見までとり揃え、病理画像と対比させて編集した。

本書を用いて実臨床で得られた画像をより正確に判別することにより、冠動脈疾患の病態理解の一助となることを期待する。

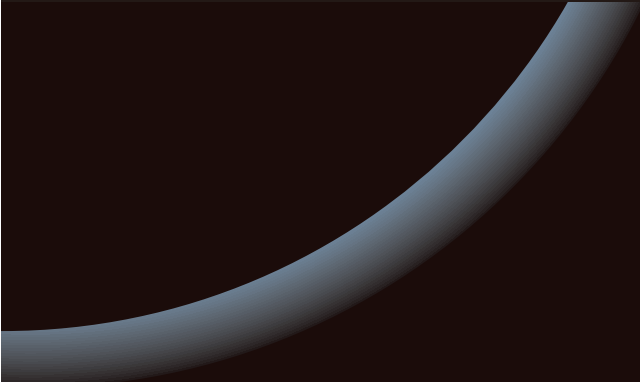
和歌山県立医科大学 赤阪 隆史
岩手医科大学 森野 禎浩
東海大学 中澤 学



FD-OCT is a high-resolution intracoronary imaging technology based on near-infrared interferometry. Since the technology becomes available, it provided us with precise assessment close to the histopathological microscopic images in much simple procedure. It visualizes in different aspect from IVUS and provides us new findings, however its contribution to the clinical benefit is still unknown. In this image atlas, we collected from typical to ambiguous OFDI images may be encountered in cath lab and sorted as Q&A style.

We hope this atlas will help clinicians to understand coronary artery disease.

Takashi Akasaka (Wakayama Medical University)
Yoshihiro Morino (Iwate Medical University)
Gaku Nakazawa (Tokai University)

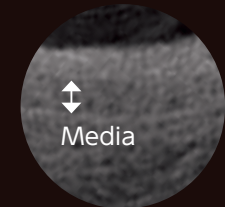
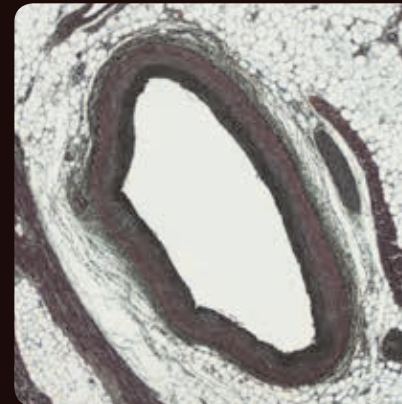
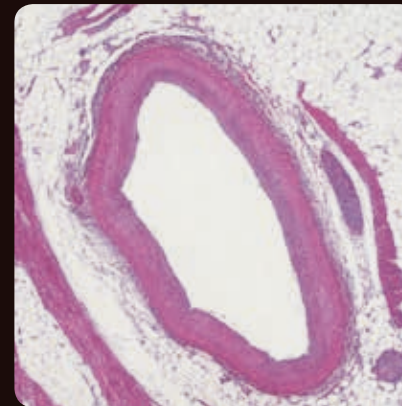
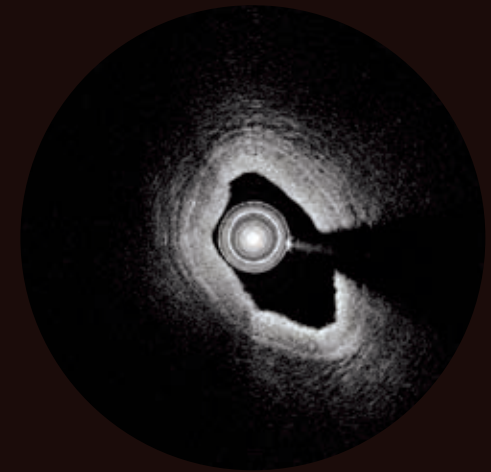
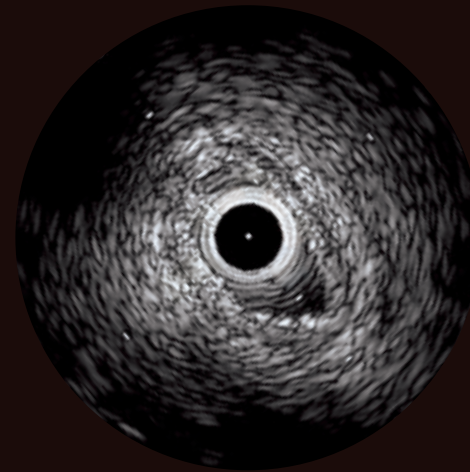
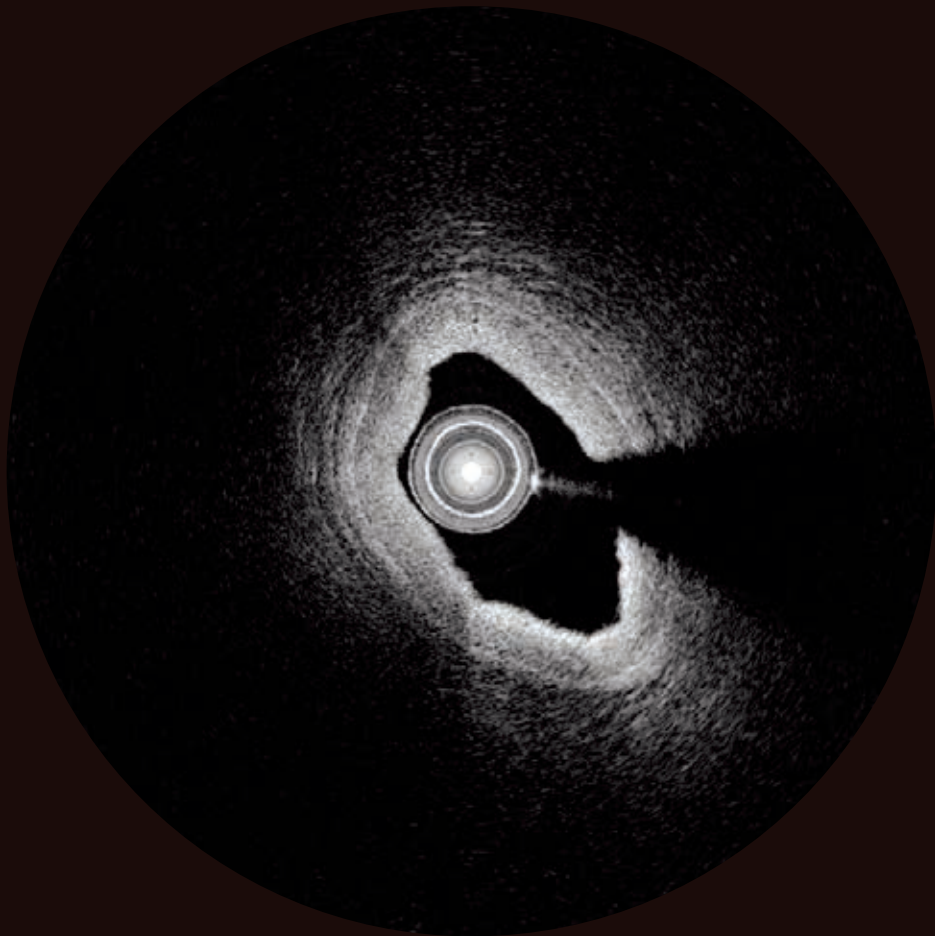


Case List

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- #30 Calcified Plaque with lipid component
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- #32 Intra-plaque hemorrhage
- #33 Cholesterol cleft

#1

#1 Normal Coronary Artery

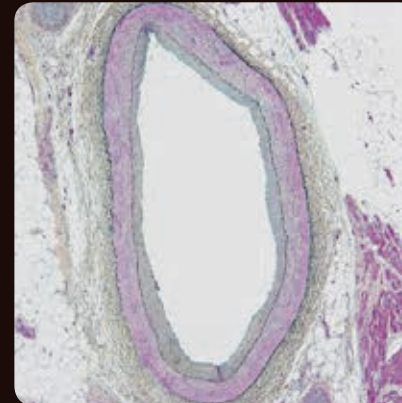
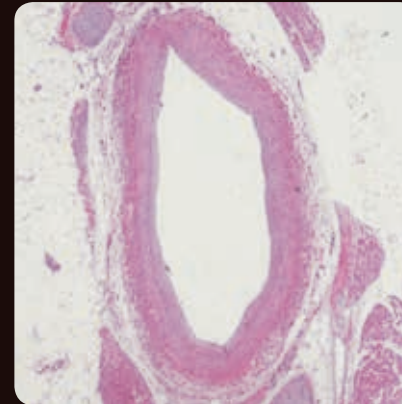
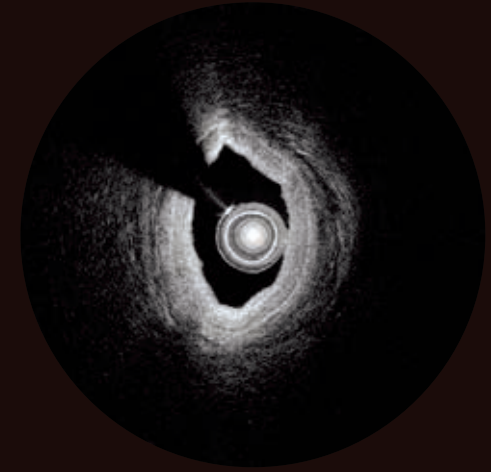
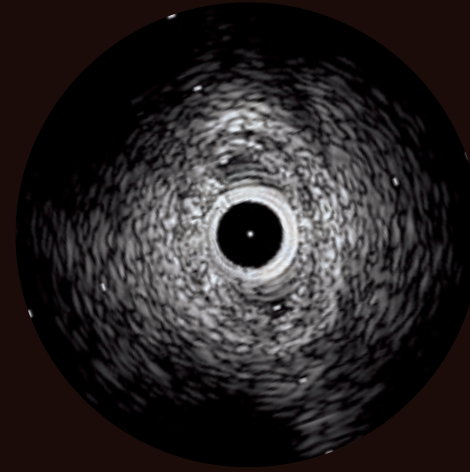


3 layers of vessel structure is observable. From far side, adventitia, media, and intima. Media is generally visualized as low signal band.

血管壁は外側から外膜、中膜、内膜の三層構造として認識される。中膜は通常、信号強度の弱いバンドとして描出される。

#2

#2 Normal Coronary Artery

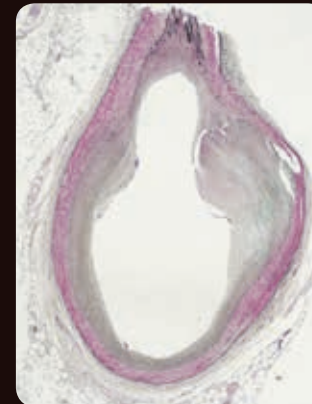
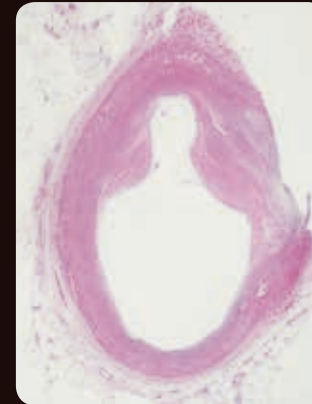
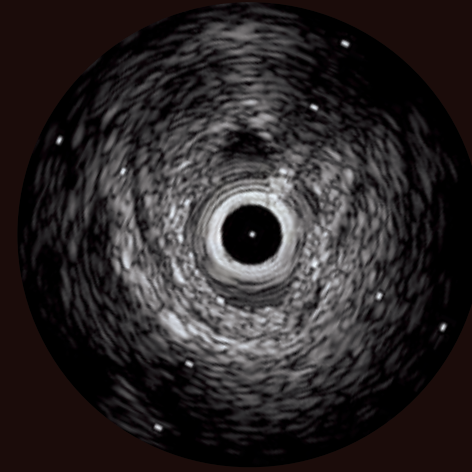


3 layers of vessel structure is observable. From far side, adventitia, media, and intima. Media is generally visualized as low signal band.

血管壁は外側から外膜、中膜、内膜の三層構造として認識される。中膜は通常、信号強度の弱いバンドとして描出される。

#3

#3 Intimal Thickening

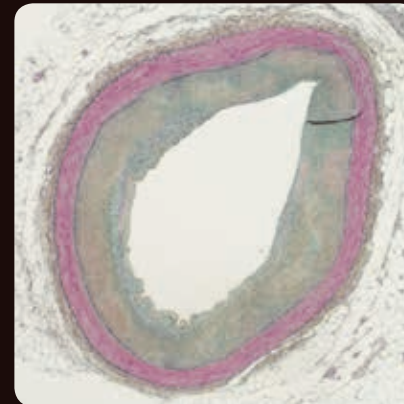
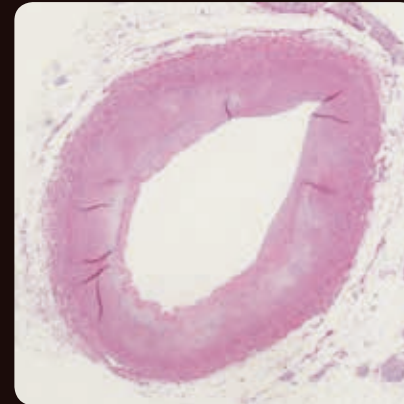
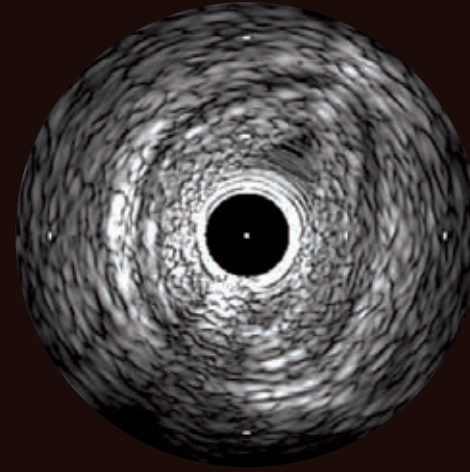


Fibrous intimal thickening is visualized as high intensity homogeneous area. Its main compositions are smooth muscle cells (SMC) and extracellular membrane. Remark of 0 o'clock is side branch.

OFDIでは線維性内膜肥厚は高輝度で均一な所見となる。内膜肥厚の主な構成成分は平滑筋細胞および細胞外基質である。0時の位置は側枝。

#4

#4 Intimal Thickening

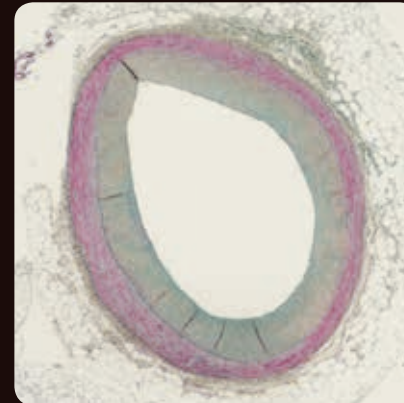
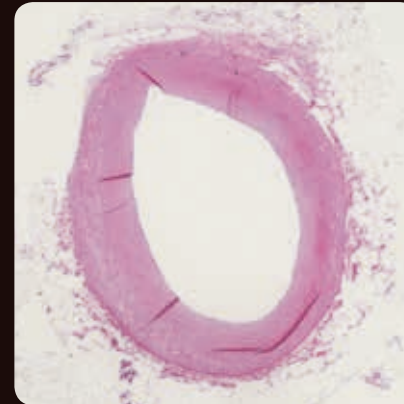
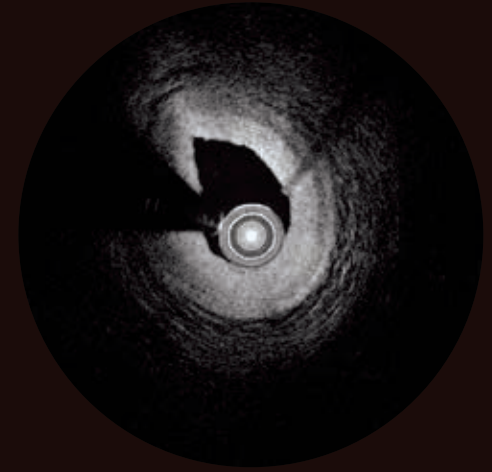
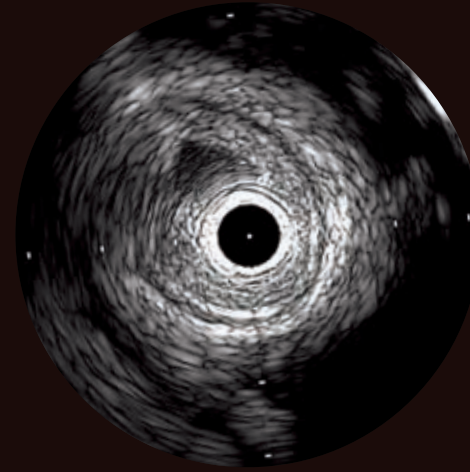


Homogeneous fibrous tissue.

均一な線維性組織。

#5

#5 Intimal Thickening

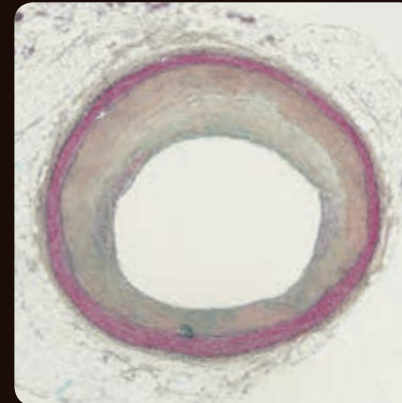
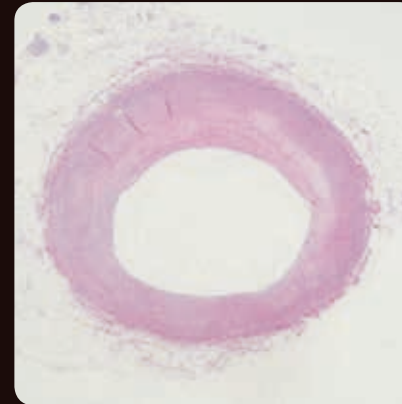
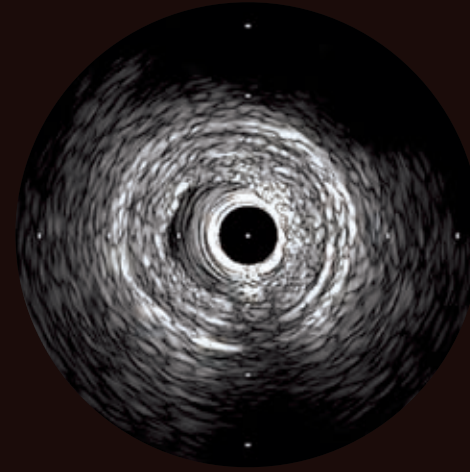


Homogeneous fibrous component.

均一な線維性成分。

#6

#6 Intimal Thickening

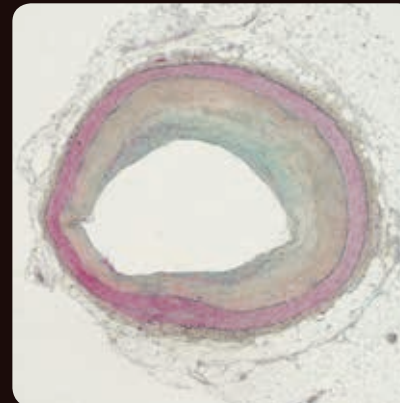
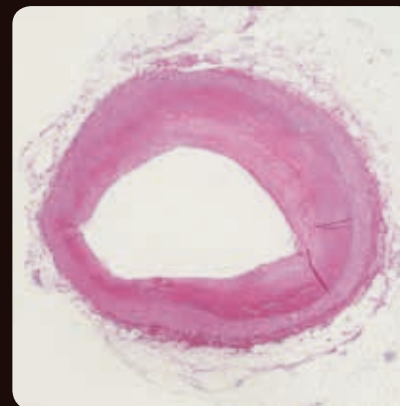
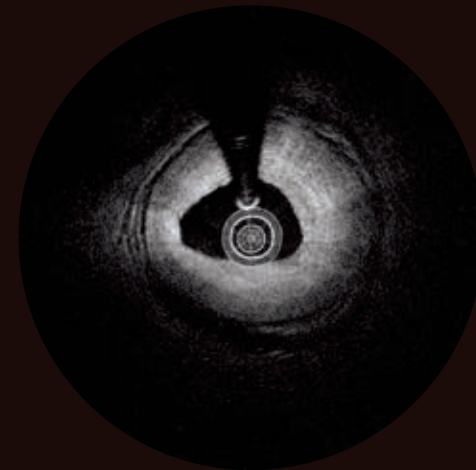
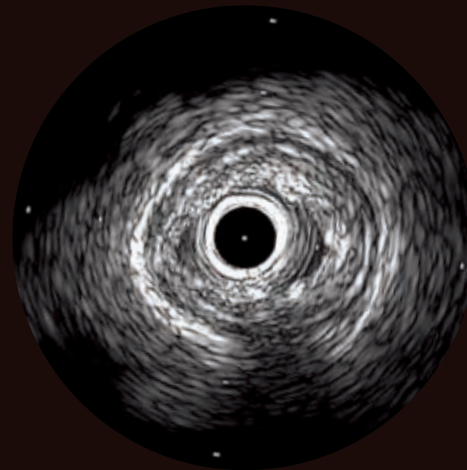
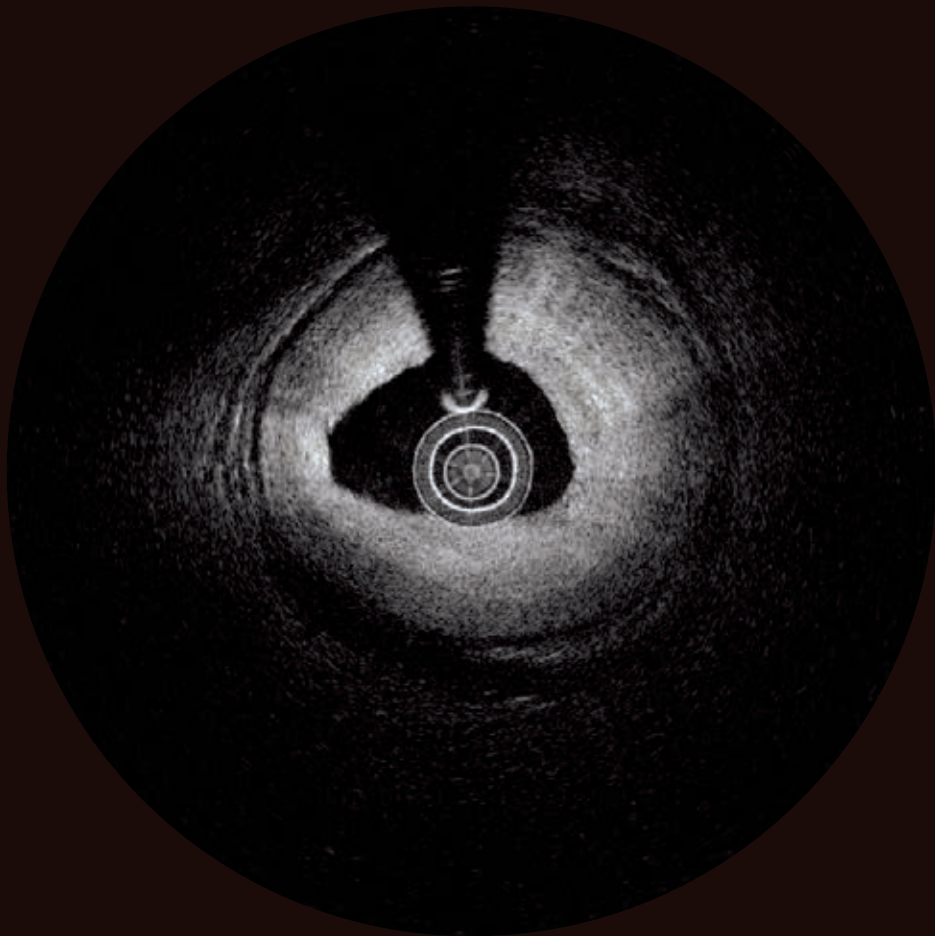


Like this case, tissue character may differ in depth. As the possibility, intimal thickening might have been progressed and rest for certain periods and re-proliferated in another phase. OFDI visualizes in layered.

本症例のように深層と浅層の組織性状が異なることがある。この所見は、内膜肥厚が進み、一時的に停止後、また再開した可能性を示している。このような場合、OFDIではしばしば層状に描出される。

#7

#7 Intimal Thickening

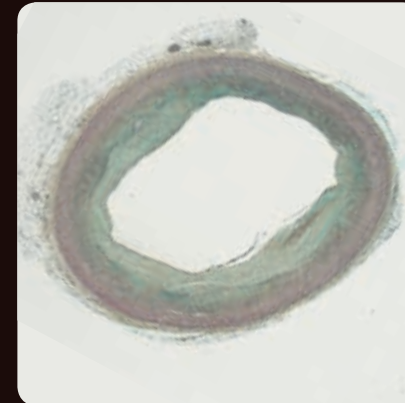
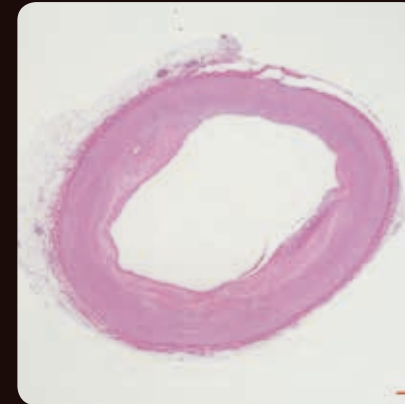
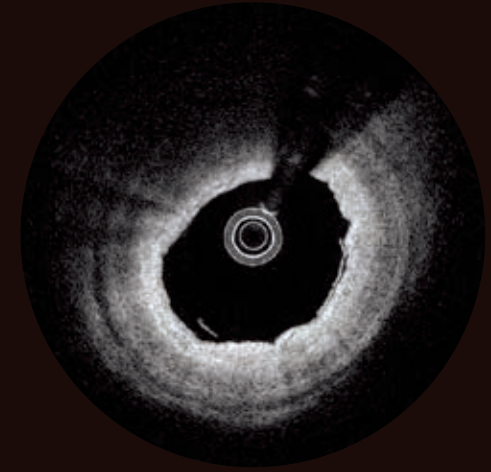
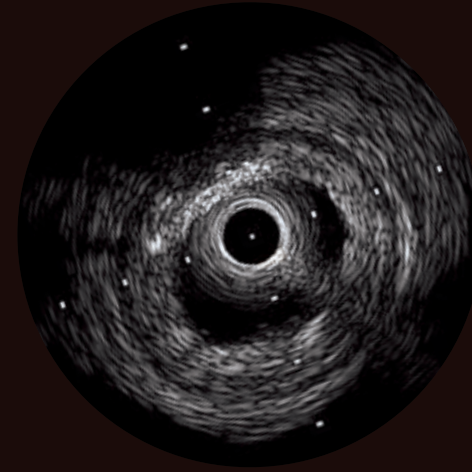


Another case of layered intima. As the possibility, intimal thickening might have been progressed and rest for certain periods and re-proliferated in another phase. OFDI visualizes these type in layered.

別症例における層状に肥厚した内膜。内膜肥厚が進行後、一時的に停止後、また再開した可能性を示している。このような場合、OFDI上ではしばしば層状に描出される。

#8

#8 Intimal Thickening

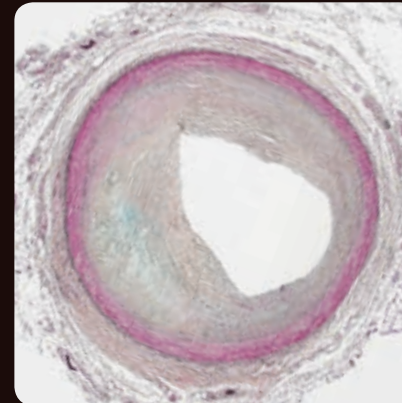
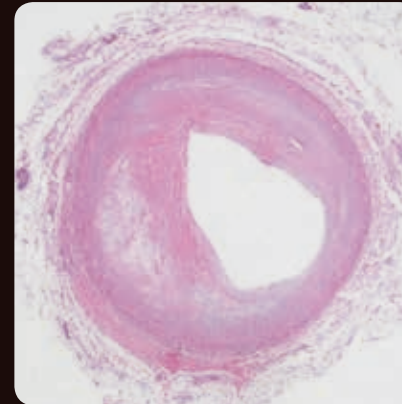
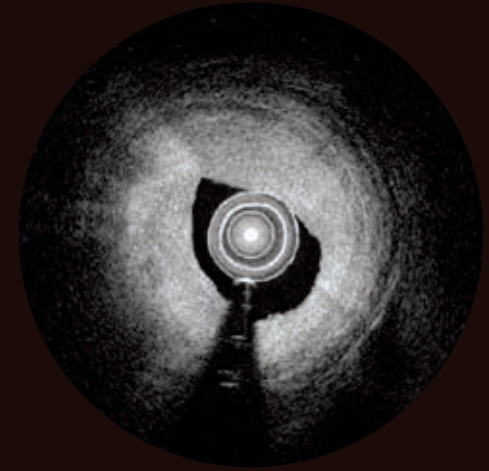
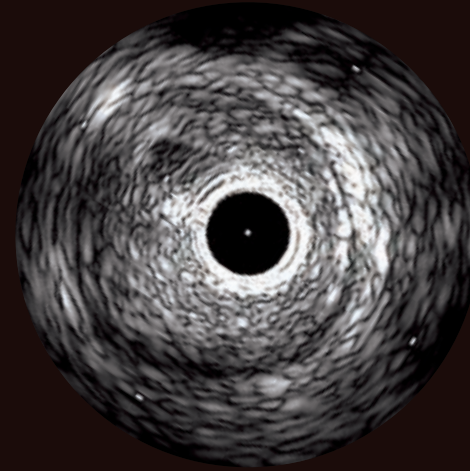


Mainly its compositions are proliferated SMC and extracellular matrix, though signal may vary by amount of proteoglycan within. Occasionally, more the proteoglycan, lower the signal and more the SMC/collagenous fiber, higher the signal. In this case, at 10 - 12 o'clock, proteoglycan rich thickening is observable.

内膜肥厚部は増殖した平滑筋細胞および細胞外基質により構成されるが、内部のプロテオグリカンの含有量により信号の強度が変化する。しばしば、プロテオグリカンが多いほど弱い信号強度に、平滑筋細胞や膠原線維が多いほど強い信号強度になる。本症例では、プロテオグリカンが豊富な肥厚が10-12時の位置に認められる。

#9

#9 PIT (Pathological Intimal Thickening)

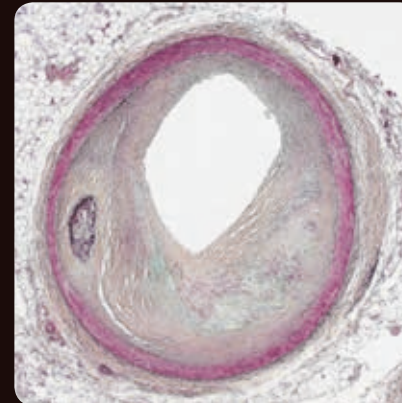
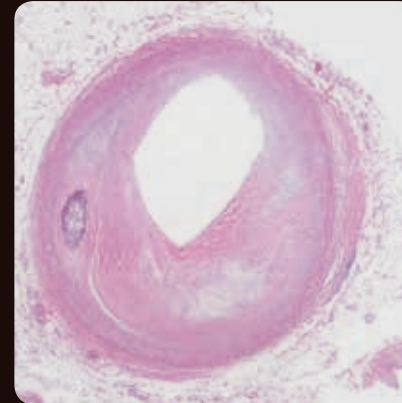
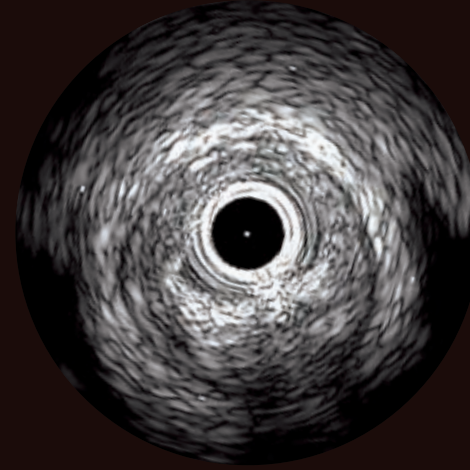


Lipid pool is observed at 6-10 o'clock. This is thought to be following phase of Intimal thickening. Generally, lipid pool starts forming near media. In OFDI observation, it occasionally shows with mild attenuation of signal.

6-10時の位置に脂質プールを認める。この所見は内膜肥厚の次の段階と考えられる。通常、脂質プールは中膜付近で形成され始める。OFDIでは、しばしば信号強度の軽度な減衰がみられる。

#10

#10 PIT (Pathological Intimal Thickening)

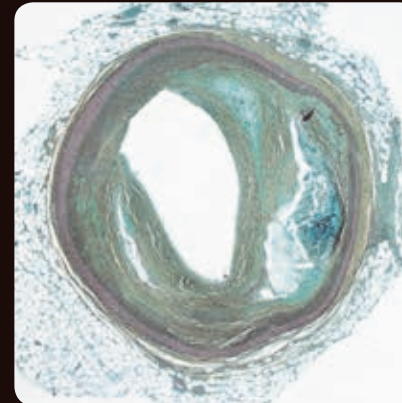
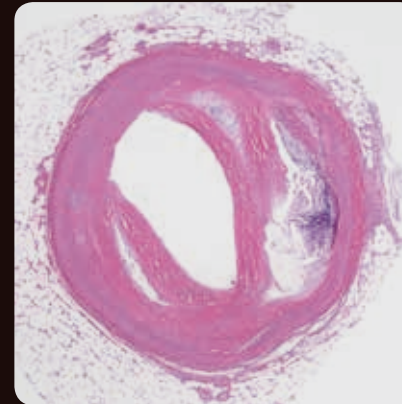
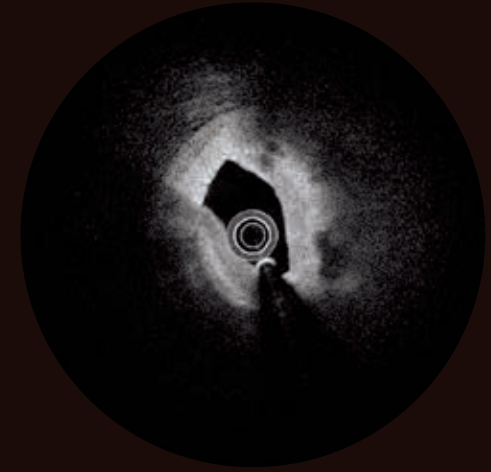
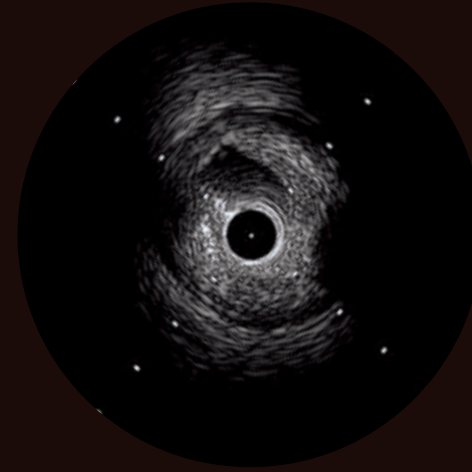


Lipid pool is observed at 3-7 o'clock. This case shows slightly higher attenuation of signal. At 9 o'clock, localized calcification is also observed.

3-7時の位置に脂質プールを認める。本症例では信号強度の減衰がやや著しい。9時の位置には限局した石灰化もみられる。

#11

#11 Fibroatheroma

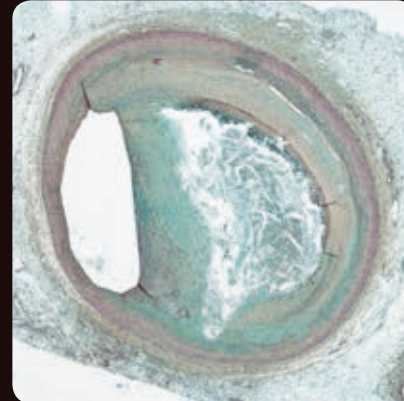
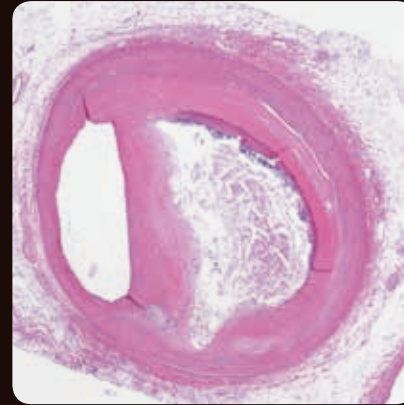
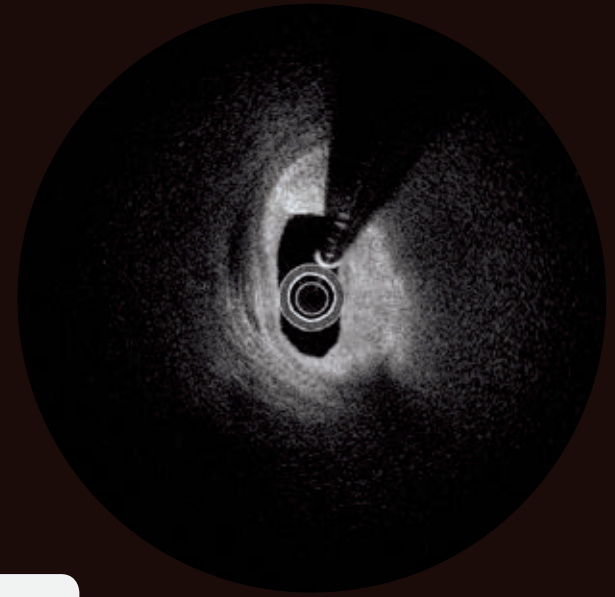
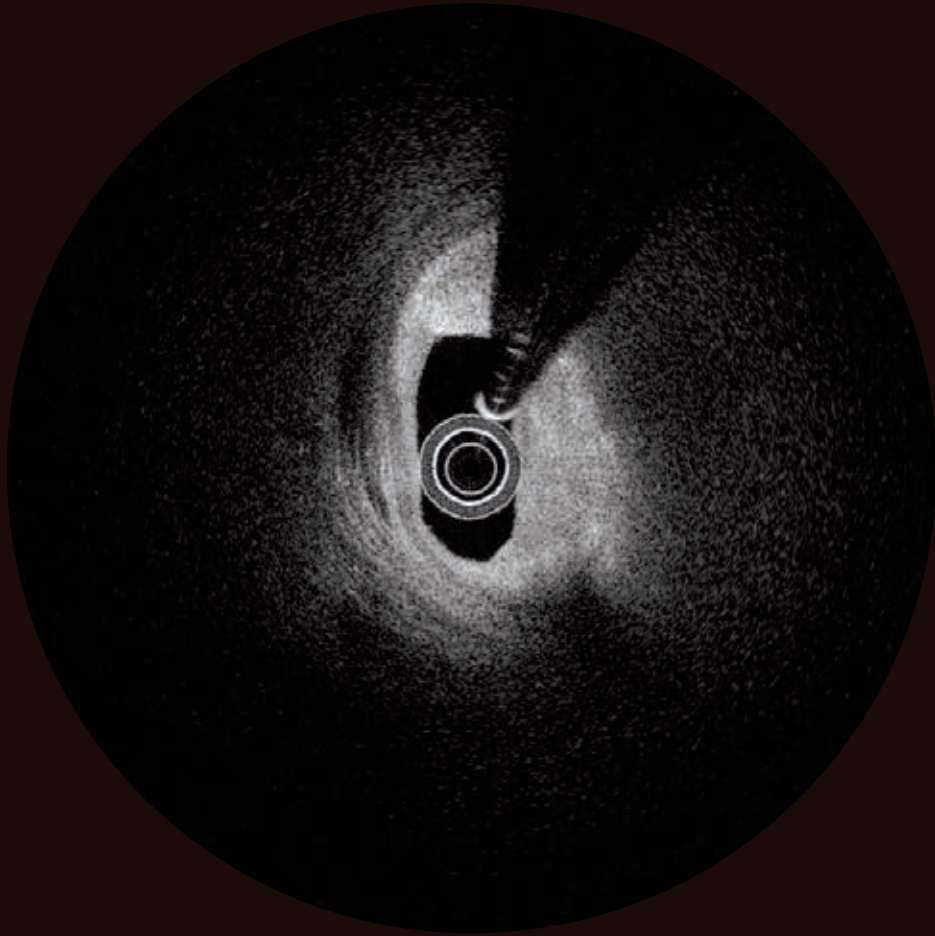


Fibroatheroma is more advanced plaque. It is considered that macrophage penetrated into lipid pool and form necrosis and eventually loses matrix, so called Necrotic core. Necrotic core is one of the significant characteristics of Fibroatheroma.

Fibroatheromaはプラーク形成がさらに進行した病変である。マクロファージが脂質プール内へ浸潤してネクロシスを起こし、基質が失われた状態を壊死性コアという。壊死性コアを有することはFibroatheromaの大きな特徴の1つである。

#12

#12 Fibroatheroma

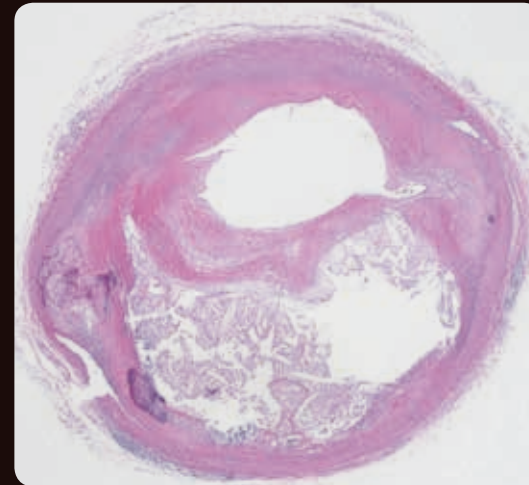


Very large Necrotic core is observed in right hemisphere. It shows high attenuation in OFDI.

特徴的な大きな壊死性コアを右半球に認める。OFDI像で信号強度の著しい減衰がみられる。

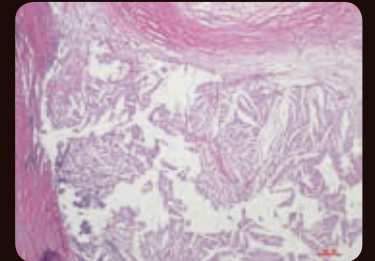
#13

#13 Fibroatheroma (with thick fibrous-cap)



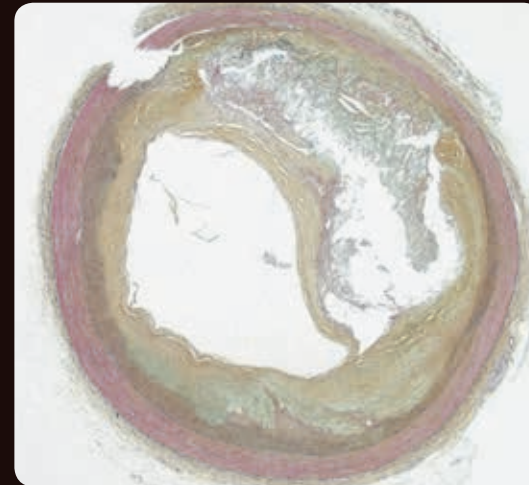
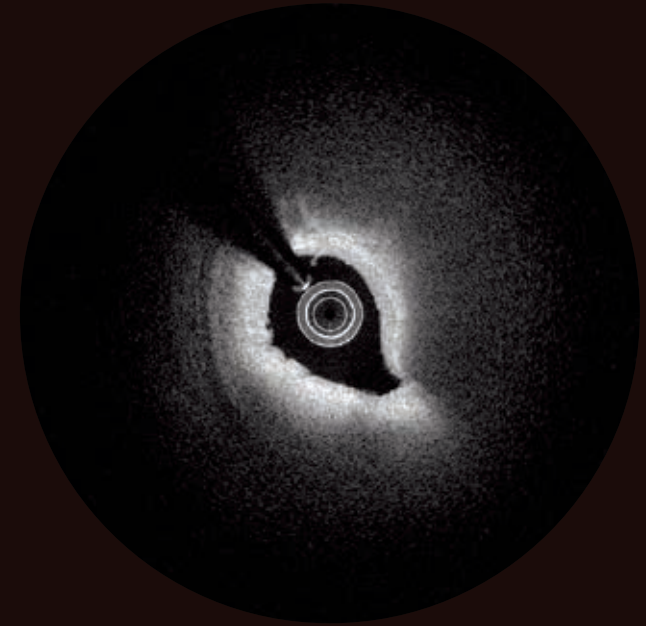
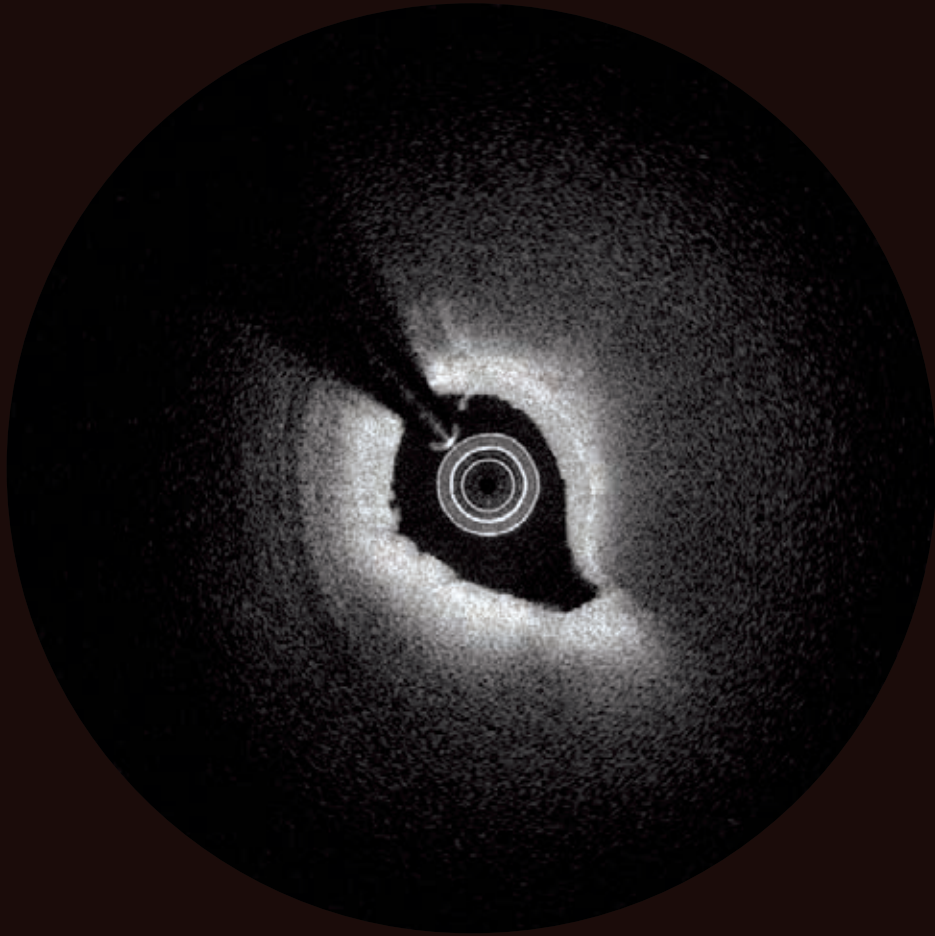
There is a large necrotic core at 5-8 o'clock.

5-8時の位置に大きな壊死性コアを認める。



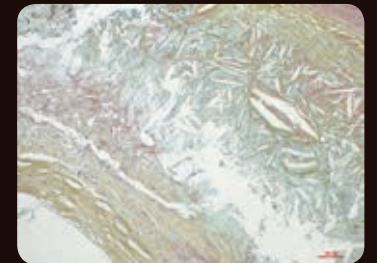
#14

#14 Fibroatheroma (with thick fibrous-cap)



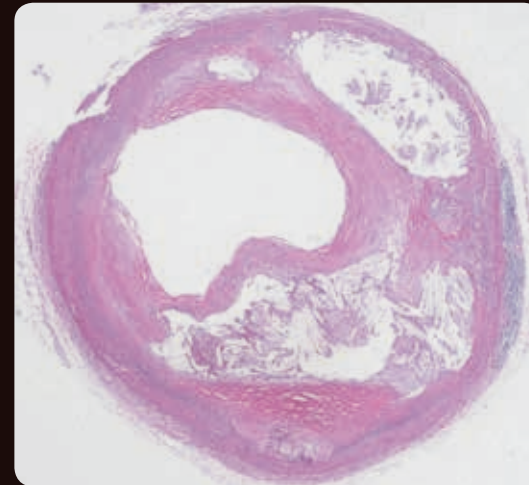
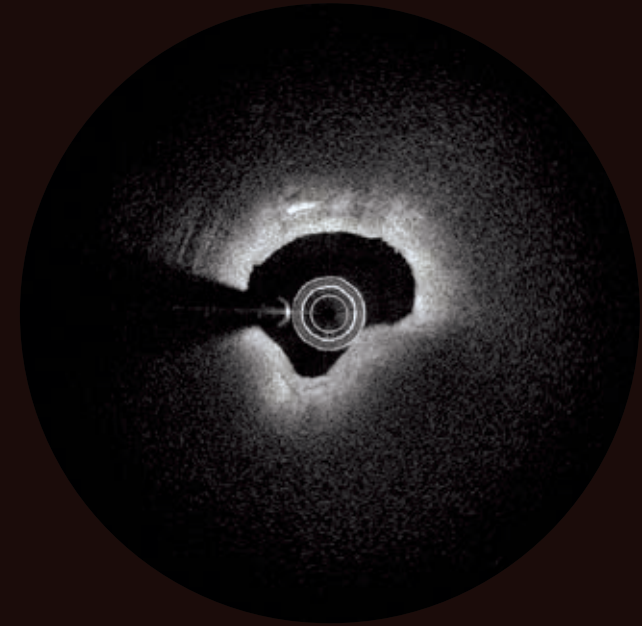
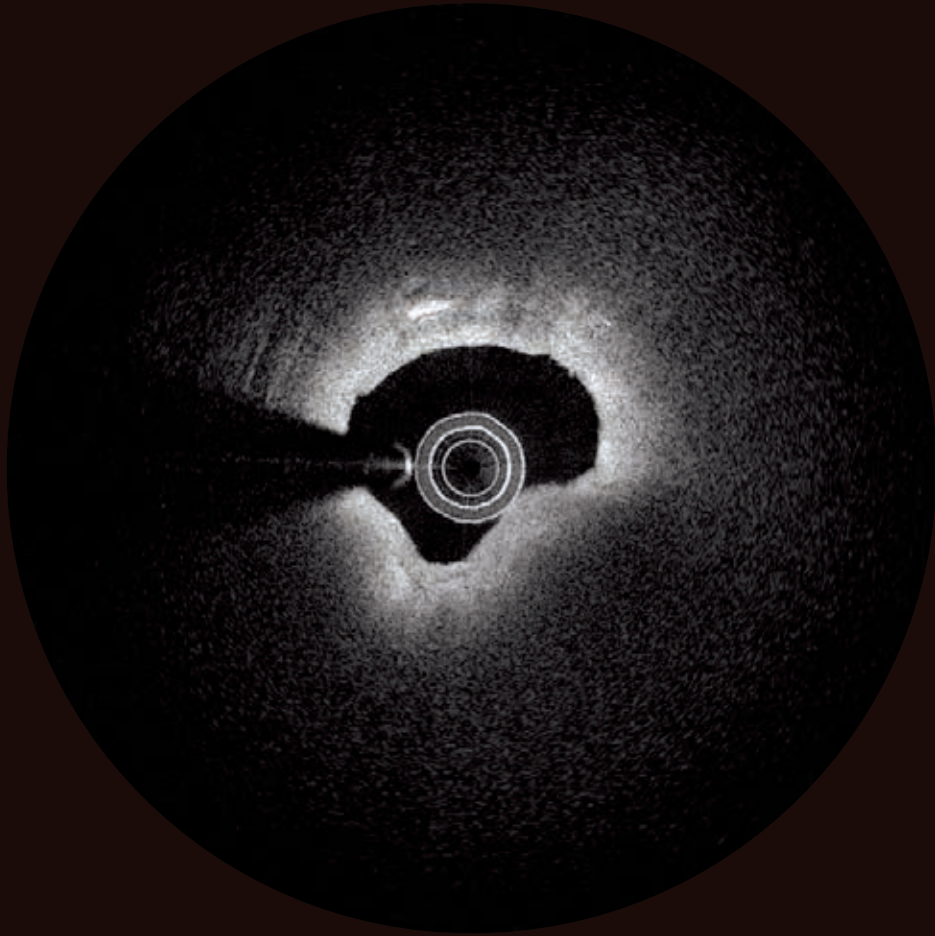
There is a large necrotic core at 11-5 o'clock. Partially fibrous cap is thin.

11-5時の位置に大きな壊死性コアを認める。線維性被膜の薄い部分がある。



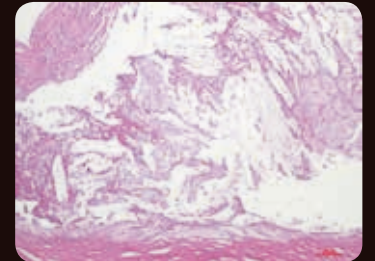
#15

#15 Fibroatheroma (with thick fibrous-cap)



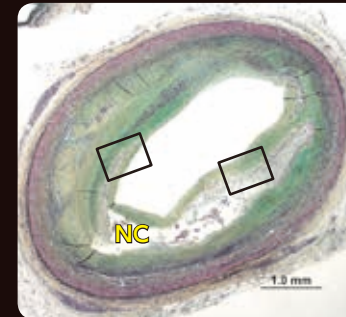
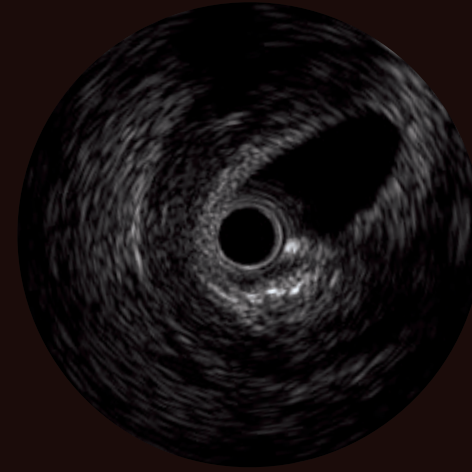
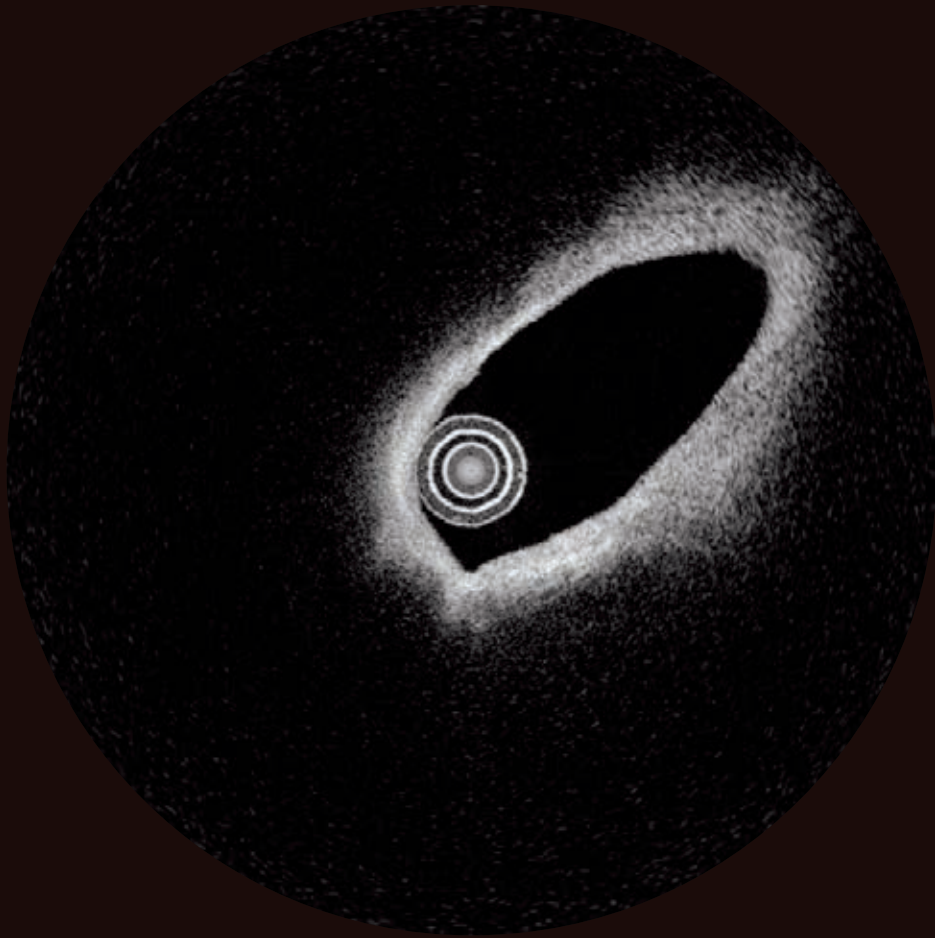
There is a large necrotic core at 3-8 o'clock.

3-8時の位置に大きな壊死性コアを認める。



#16

#16 Fibroatheroma (with thick fibrous-cap)

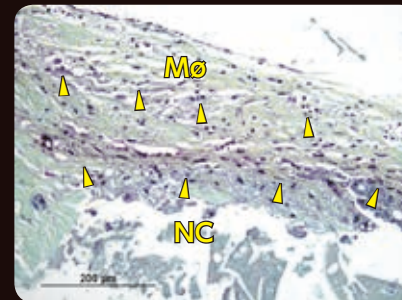
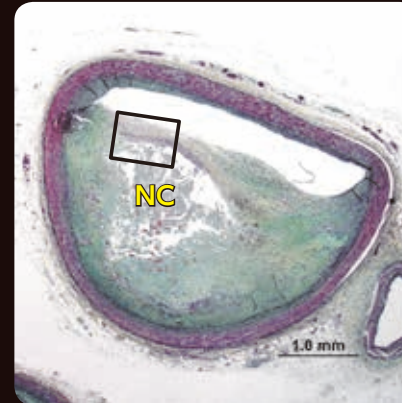


Necrotic core is observed at 3-8 o'clock and Fibrous cap is relatively thick. Although, OFDI observation at 9 o'clock is similar to Fibroatheroma, there is macrophage accumulation on the surface of Fibrous plaque and no identification of Necrotic core from histology.

3-8時の位置に壊死性コアを認め、その線維性被膜は比較的厚い。OFDIでは9時の位置にFibroatheroma様に描出されるが、病理所見では線維性プラークの表層にマクロファージの集積を認めるのみで、壊死性コアは認めない。

#17

#17 Fibroatheroma (with thick fibrous-cap)

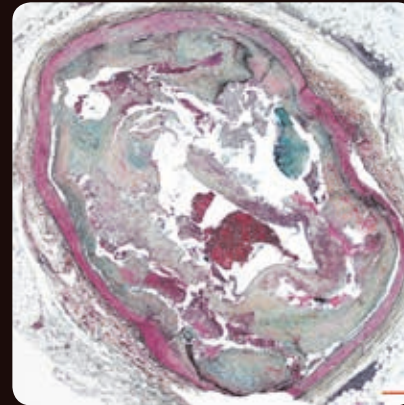
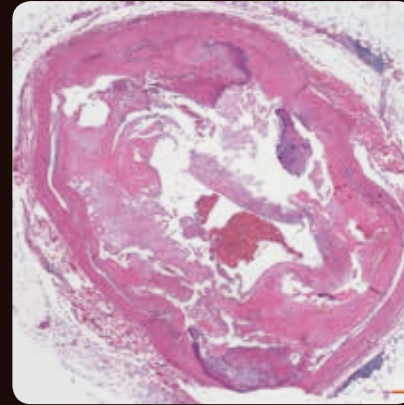
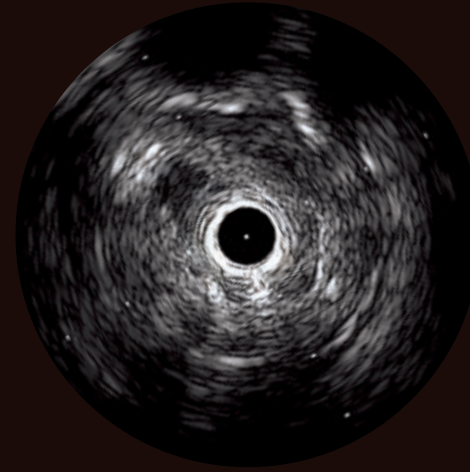


Thick fibrous cap and macrophage accumulation are found at 7-8 o'clock from pathology.

病理解析では、7-8時の位置に厚い線維性被膜とマクロファージの集積を認める。

#18

#18 Fibroatheroma (with thin fibrous-cap)

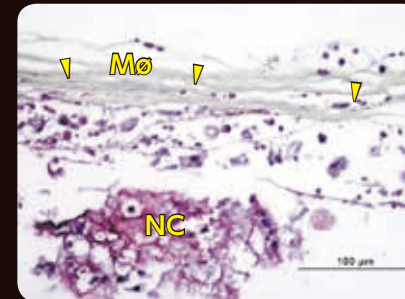
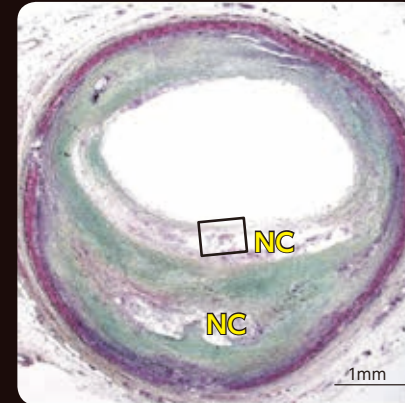
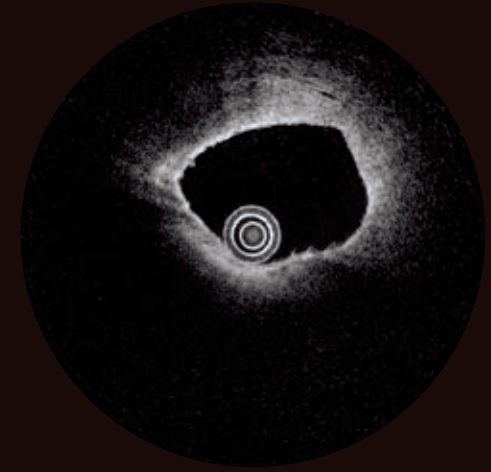
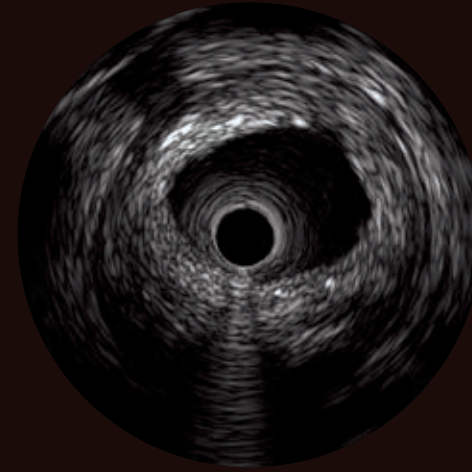
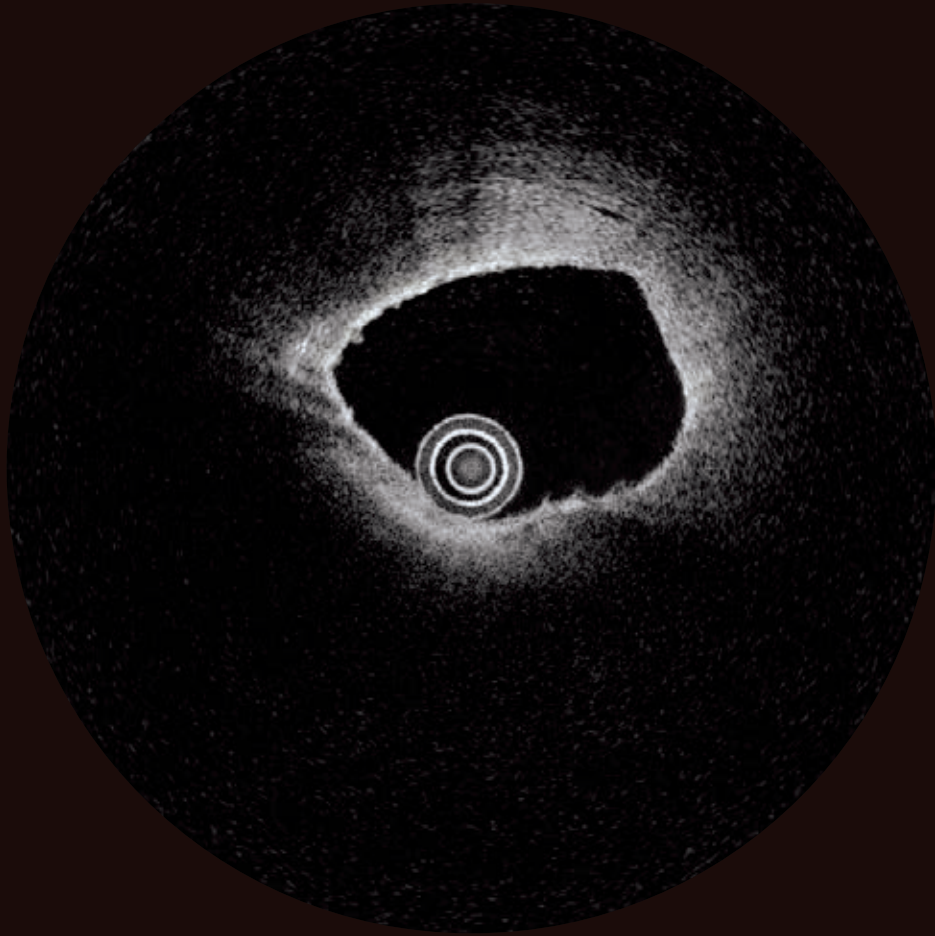


Thin fibrous cap is found at 12-3 o'clock. This indication diagnoses as Thin-cap fibroatheroma (TCFA).

12-3時の位置に薄い線維性被膜を認める。この所見により、Thin-cap fibroatheroma (TCFA) と診断される。

#19

#19 Fibroatheroma (with thin fibrous-cap)



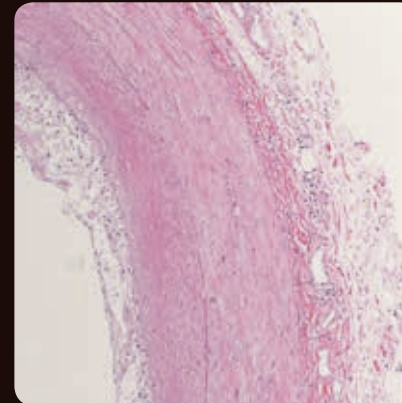
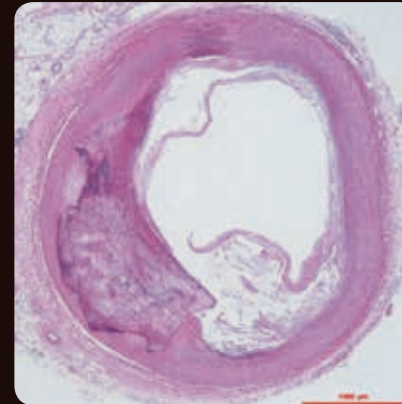
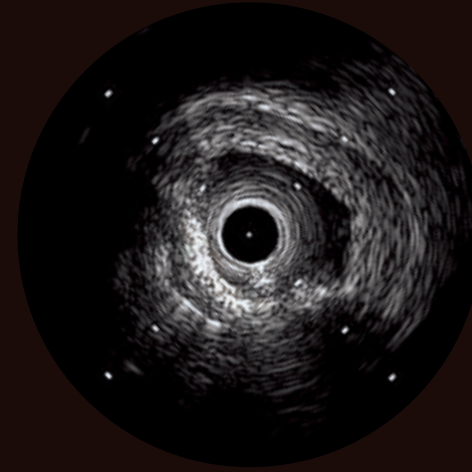
Thin fibrous cap is found at 3-9 o'clock and show indication to diagnose as Thin-cap fibroatheroma (TCFA). Although similar OFDI finding is found at 10 o'clock, it is accumulation of foamy macrophage and not the Fibroatheroma. This part is so called Pseudo-TCFA on OFDI.

3-9時の位置に薄い線維性被膜を認め、Thin-cap fibroatheroma(TCFA)と診断される。

OFDIでも同様の所見が得られるが、これは泡沫状マクロファージが集積したものであるためFibroatheromaではない。この部位はOFDI上ではPseudo-TCFAと診断される。

#20

#20 "Pseudo-" Fibroatheroma

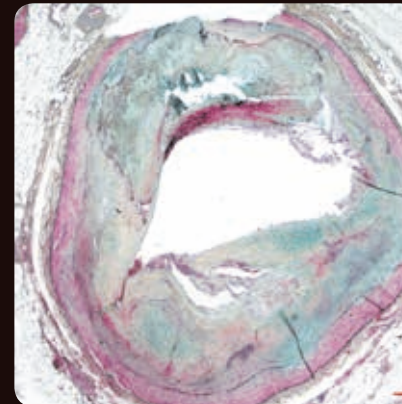
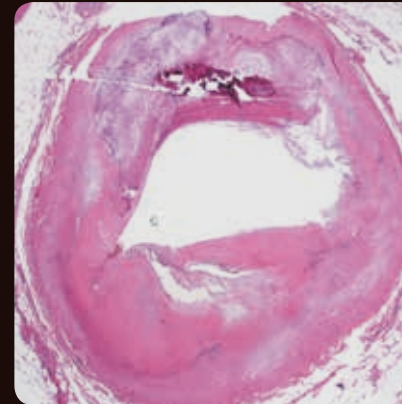
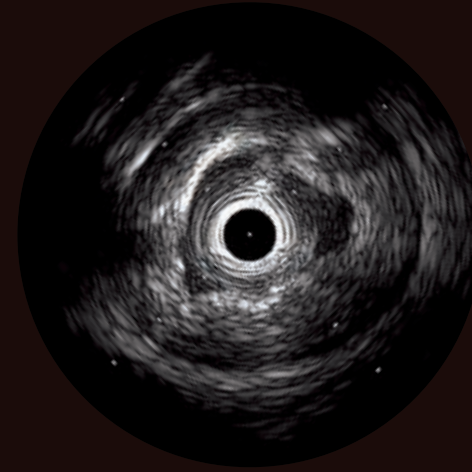
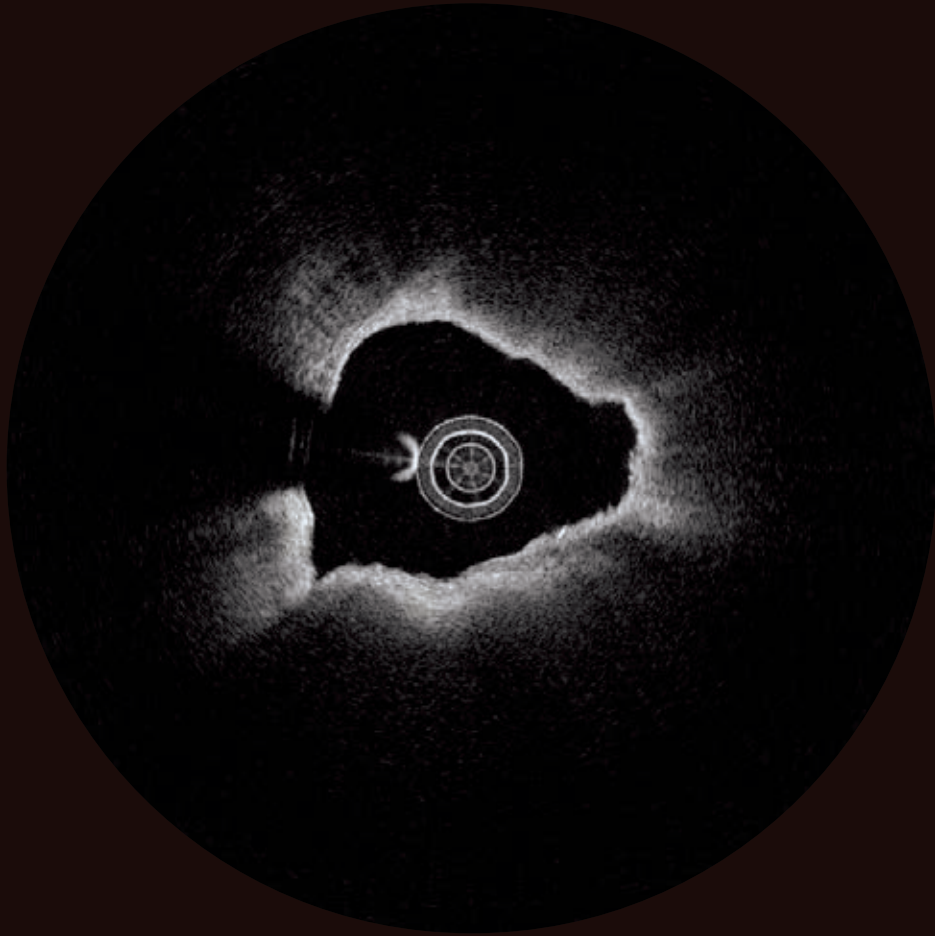


OFDI observation at 2-4 o'clock seems to be Fibroatheroma; however, from histology, it is foamy macrophage accumulation on fibrous plaque surface layer. This is so called Pseudo-FA.

OFDIでは2-4時の位置にFibroatheroma様に描出されている。しかし病理所見では線維性プラークの表層に泡沫状マクロファージの集積がみられるため、いわゆるPseudo-FAである。

#21

#21 “Pseudo-” Fibroatheroma

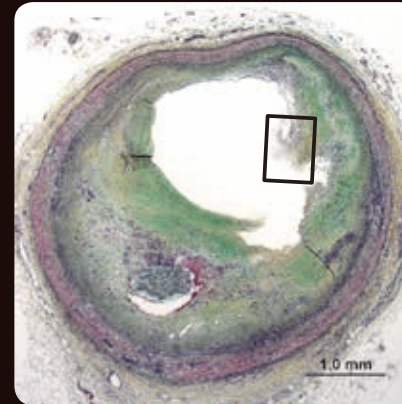
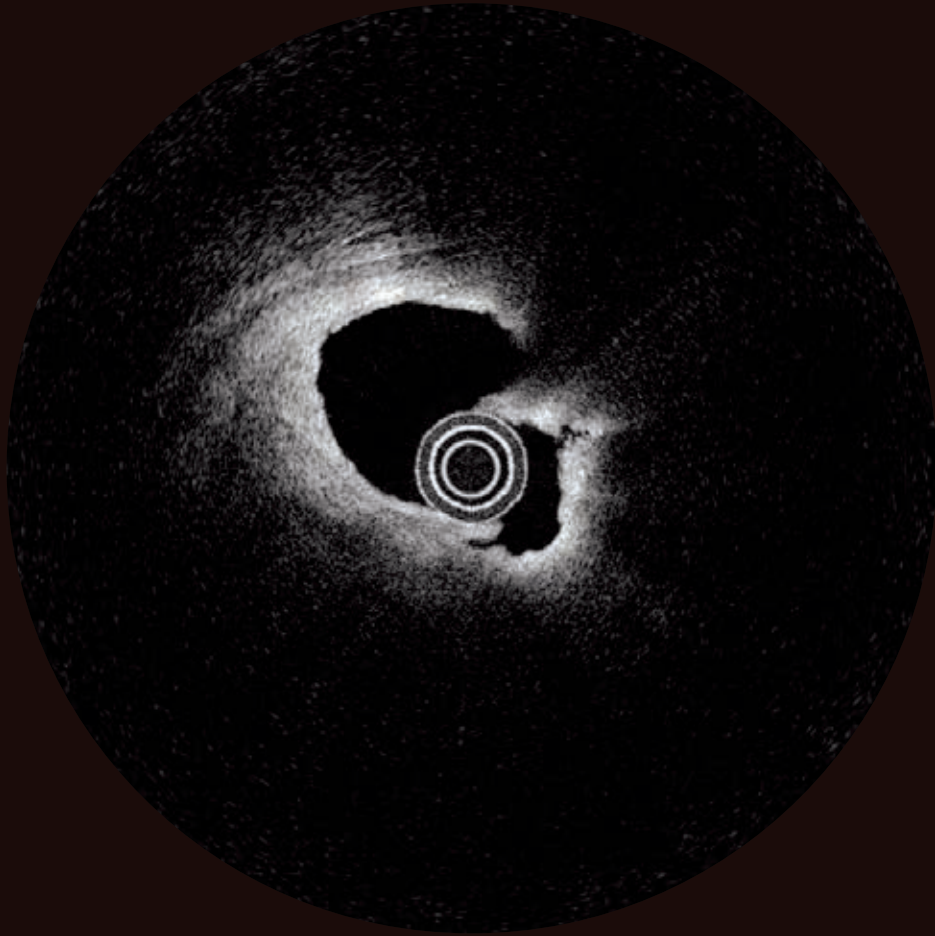


OFDI observation at 1-3 o'clock seems to be TCFA; however, from histology, it is foamy macrophage accumulation on fibro-calcific plaque surface layer. This is so called Pseudo-TCFA.

OFDI上で1-3時の位置にTCFA様に描出されているが、線維性石灰化プラークの表層に泡沫状マクロファージが集積しているのみであり、いわゆるPseudo-TCFAである。

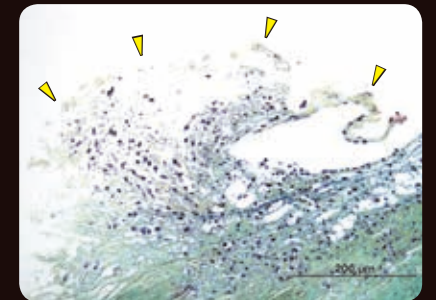
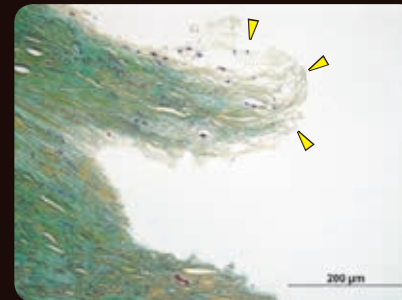
#22

#22 Ruptured plaque



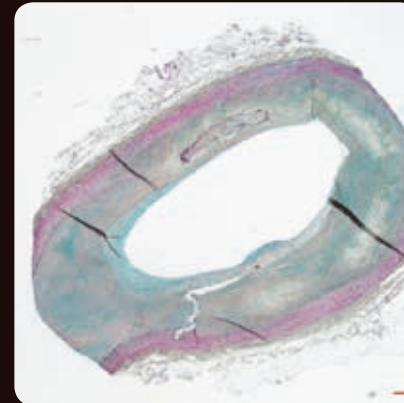
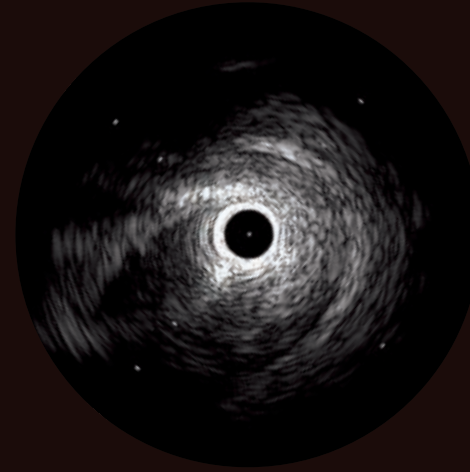
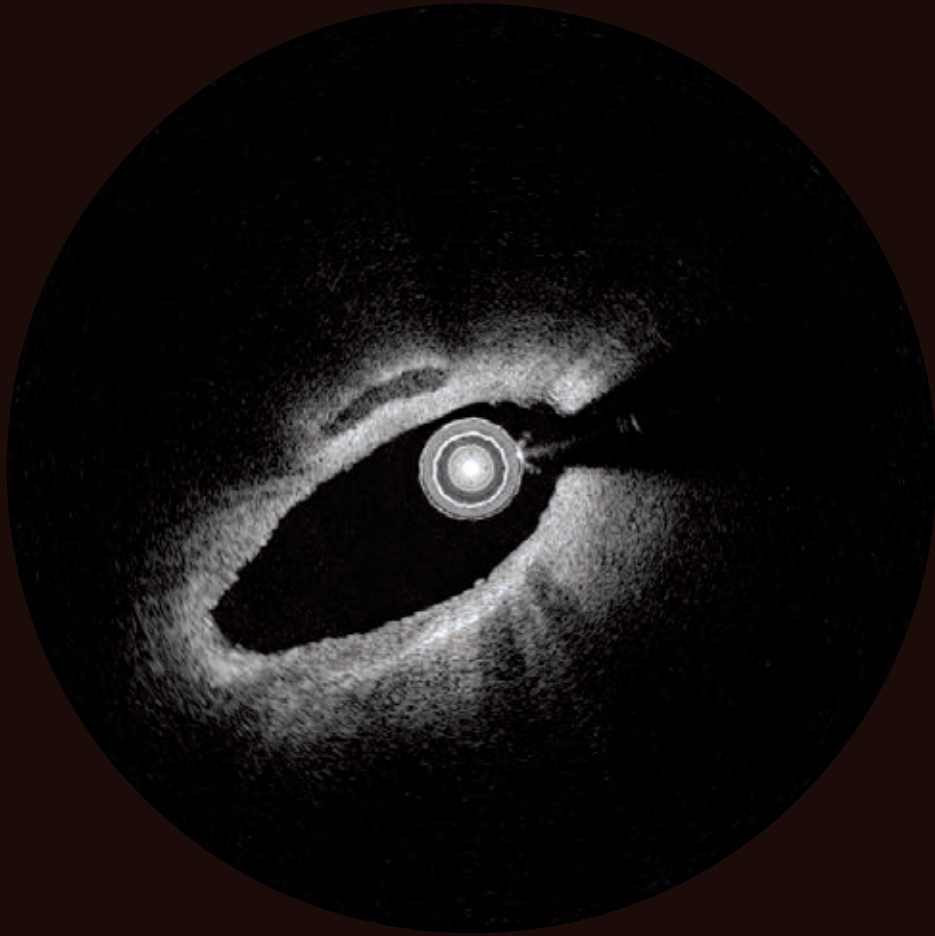
Ruptured fibrous cap is observed at 3-6 o'clock. Within a part of this fibrous cap, macrophage accumulation is found.

3-6時の位置に破裂した線維性被膜を認める。線維性被膜内の一部にマクロファージの集積がみられる。



#23

#23 Calcified Plaque (Dense)

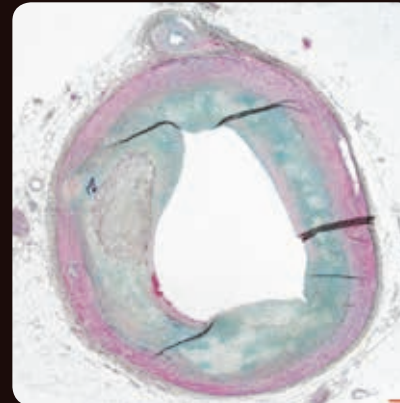
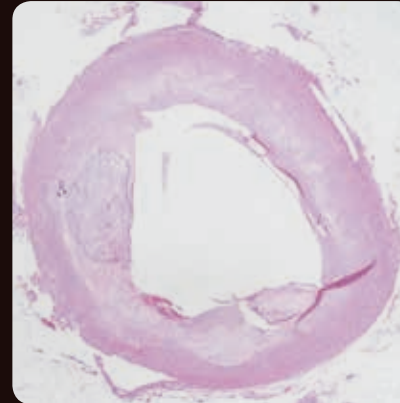
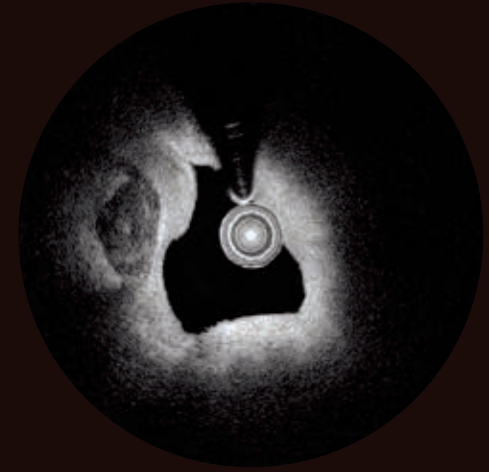
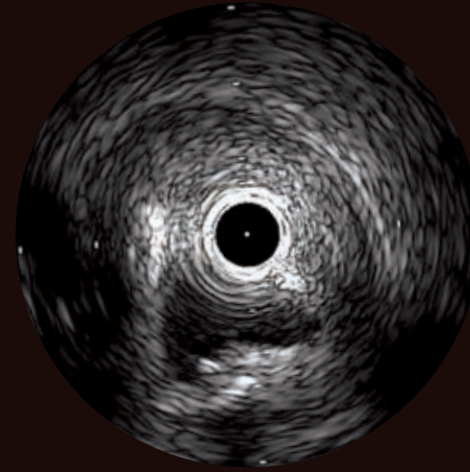


There is a localized calcification, which is found to be Low signal and Low attenuation on OFDI.

限局した石灰化を認める。OFDIでは信号強度が弱く、減衰が軽度な画像が描出される。

#24

#24 Calcified Plaque (Dense)

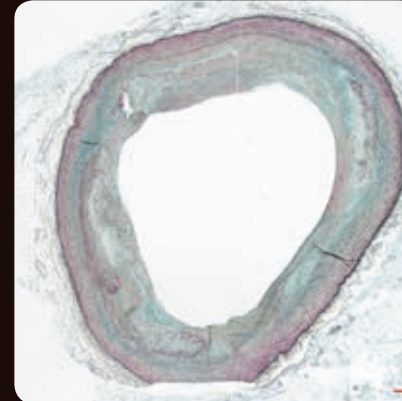
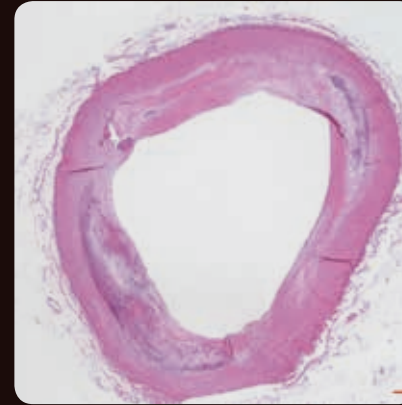
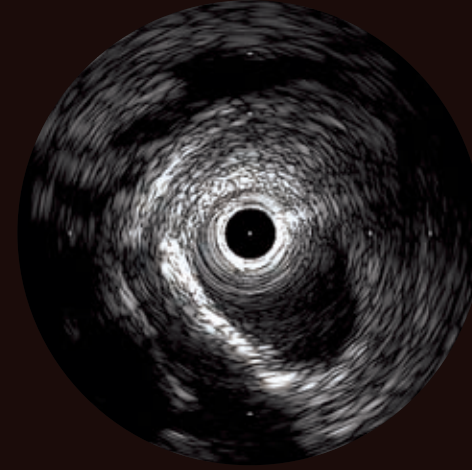


There is a localized calcification at 9 o'clock, which is found to be Low signal, Low attenuation, and heterogeneous on OFDI image.

9時の位置に限局した石灰化を認める。OFDIでは弱い信号強度、軽度な減衰、内部不均一な画像が描出される。

#25

#25 Calcified Plaque (Dense)

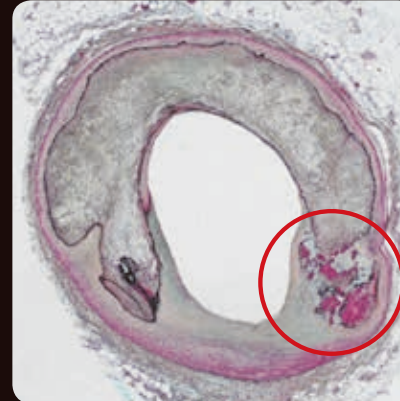
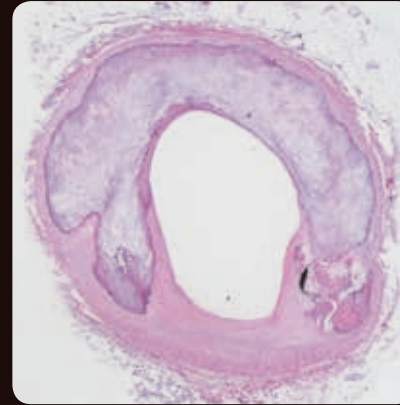
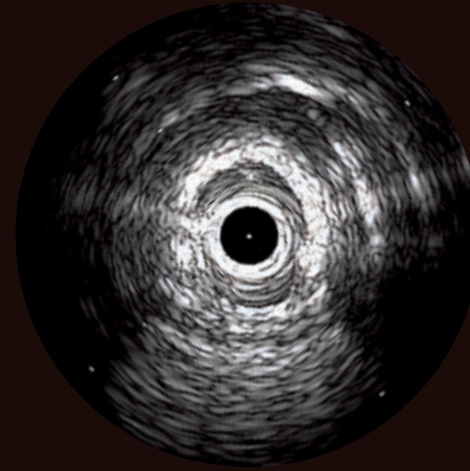


Sheet like dense calcification is found at 6-9 o'clock . On OFDI, it is Low signal and Low attenuation. As calcification get thicken, it would be observed as heterogenous texture.

6-9時の位置に板状の石灰化を認める。OFDIでは弱い信号強度と軽度な減衰がみられる。さらに石灰化が厚くなると内部不均一な構造が描出される。

#26

#26 Calcified Plaque (Dense+Nodular)

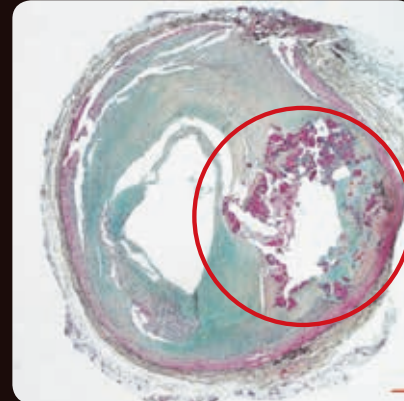
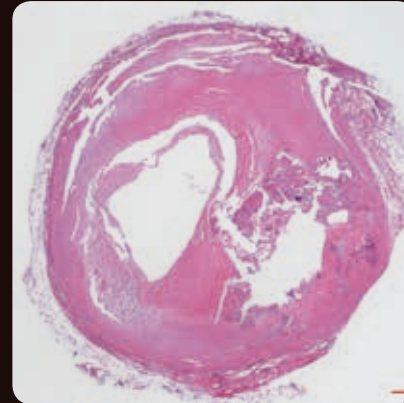
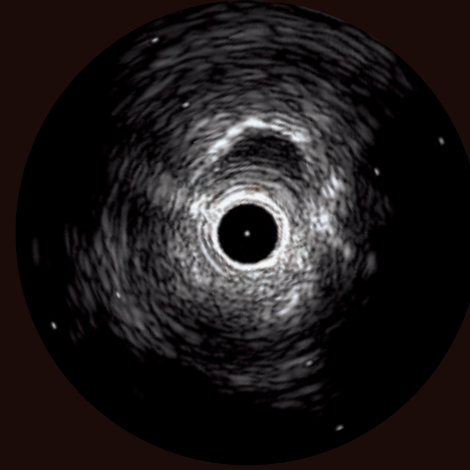
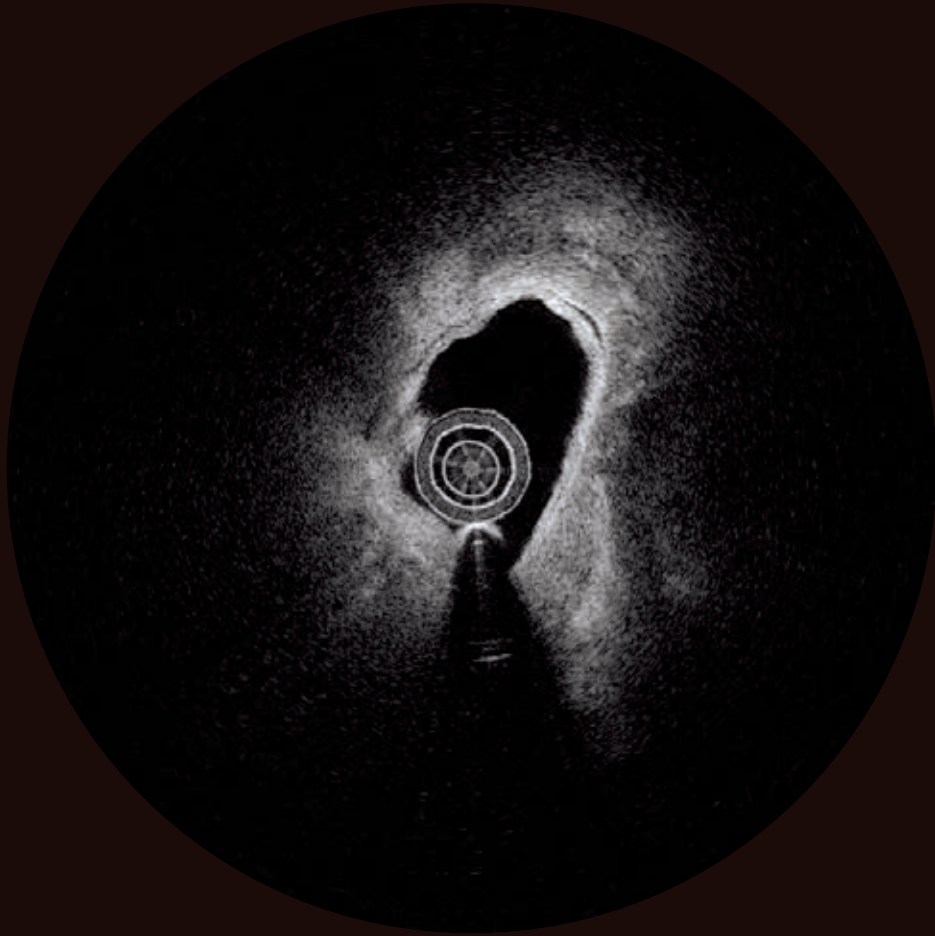


Sheet like dense calcification is found at 9-3 o'clock. At 4 o'clock, Nodular calcification is found, which shows attenuation on OFDI. Although this part is calcification, OFDI visualizes with attenuation.

9-3時の位置に板状の密な石灰化を認める。4時の位置(赤丸)に結節性石灰化がみられ、OFDI上では減衰がみられる。この部位は石灰化所見であるが、OFDIでは減衰を呈する画像が描出される。

#27

#27 Calcified Plaque (Nodular)

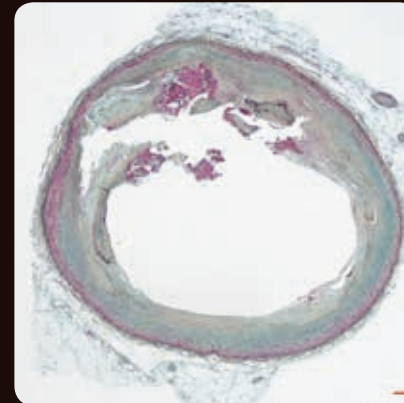
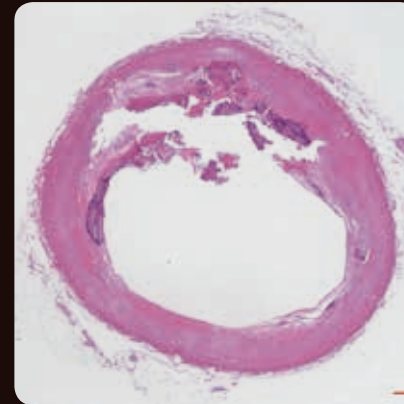
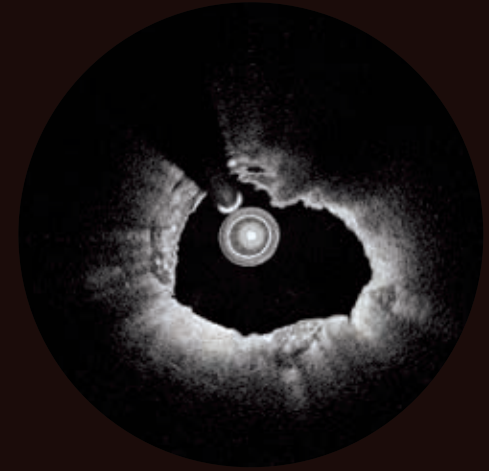
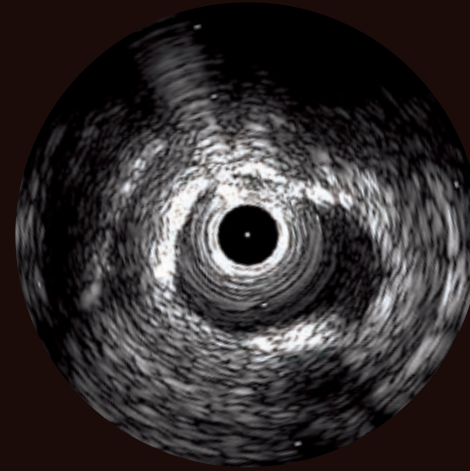
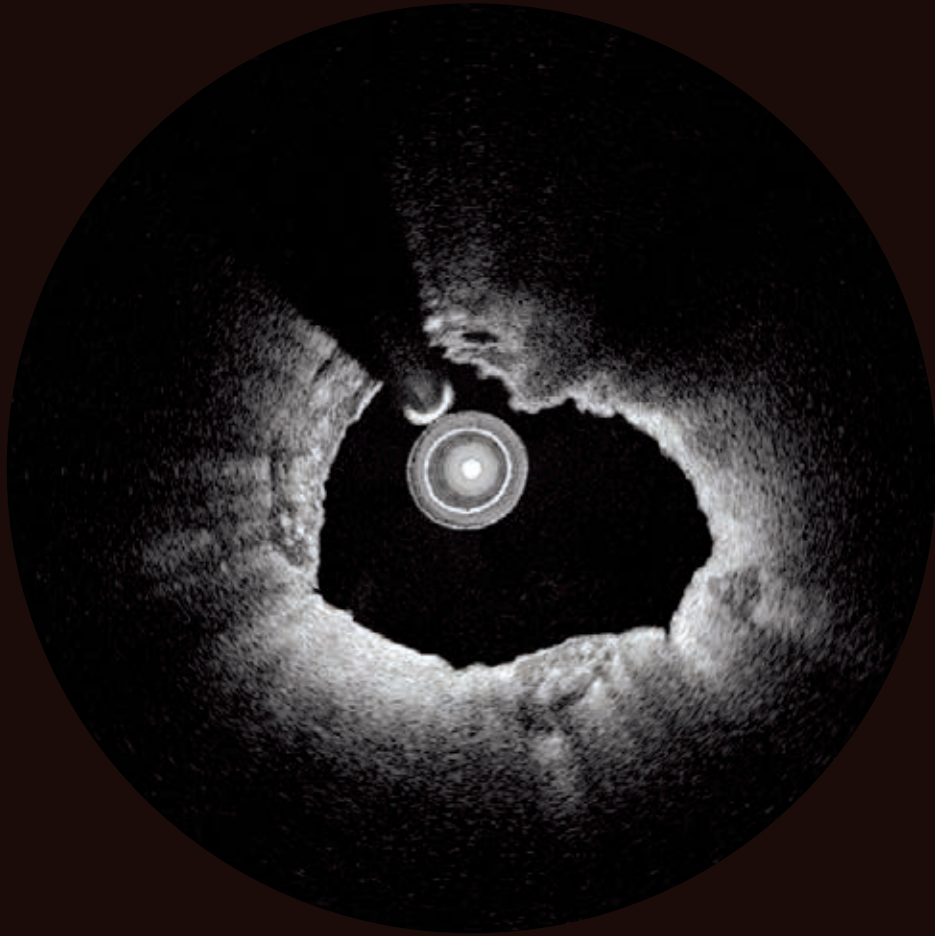


Nodular calcification is found at 3-4 o'clock and visualized with signal attenuation on OFDI.

3-4時の位置 (赤丸) に結節性石灰化を認め、OFDIでは信号強度の減衰を呈する画像が描出される。

#28

#28 Calcified Plaque (Nodular)

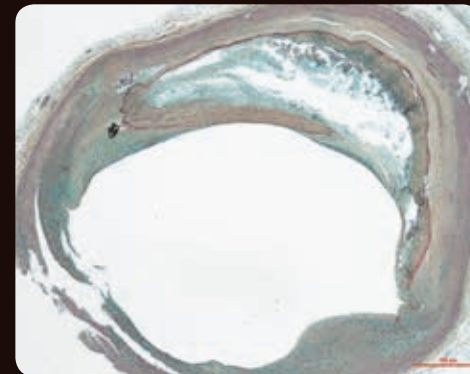
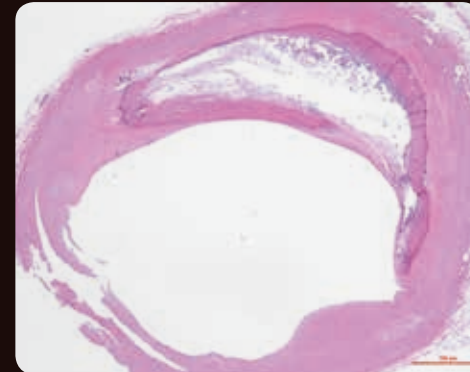
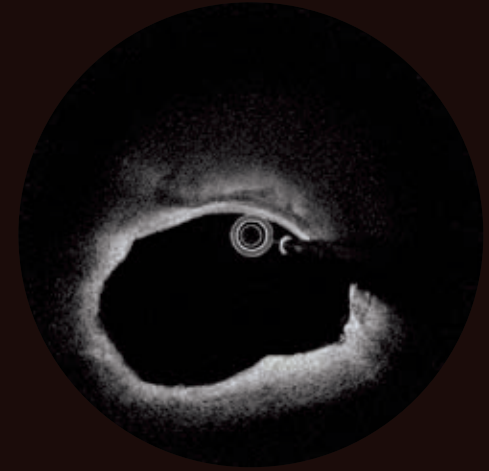
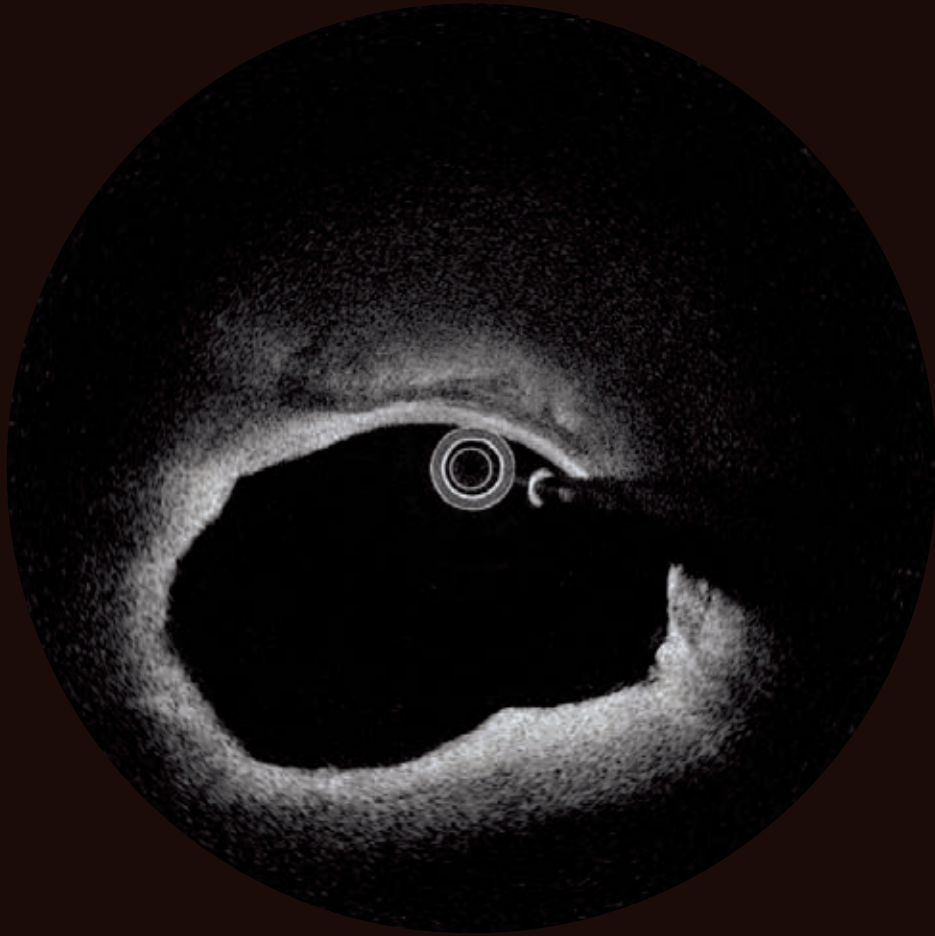


Nodular calcification is found at 12 o'clock and visualized with signal attenuation on OFDI.

12時の位置に結節性石灰化を認め、OFDIでは信号強度の減衰を呈する画像が描出される。

#29

#29 Calcified Plaque with lipid component

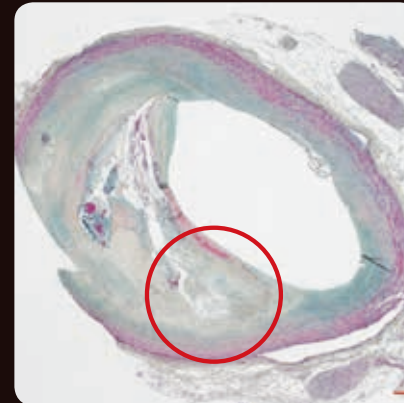
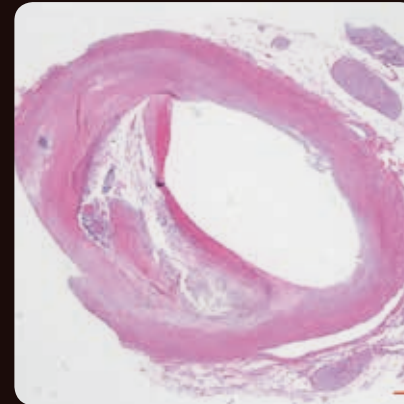
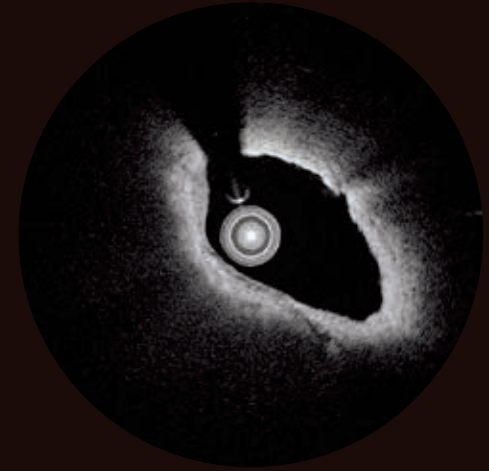
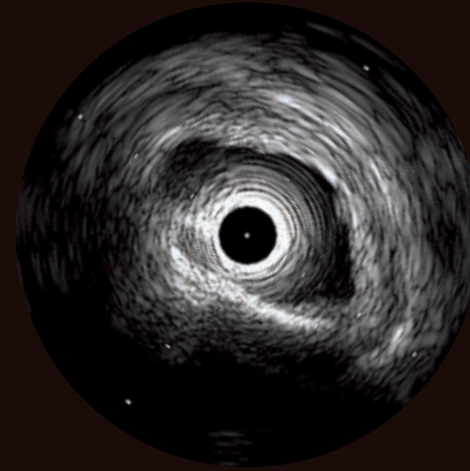


Necrotic core is surrounded by calcification. OFDI visualizes its surface with clear boarder which is typical indication of calcification but with attenuation.

石灰化の内部に壊死性コアを認める。OFDIでは石灰化の典型的所見である境界明瞭な表層が描出されるが減衰がみられる。

#30

#30 Calcified Plaque with lipid component

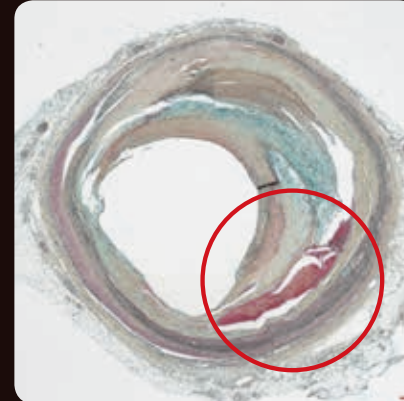
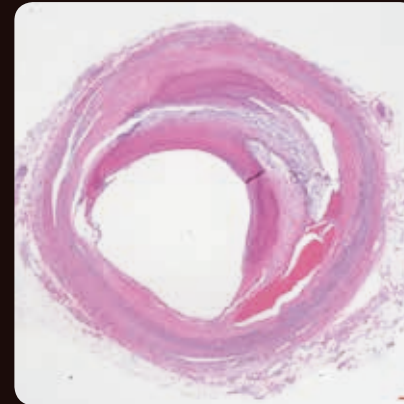
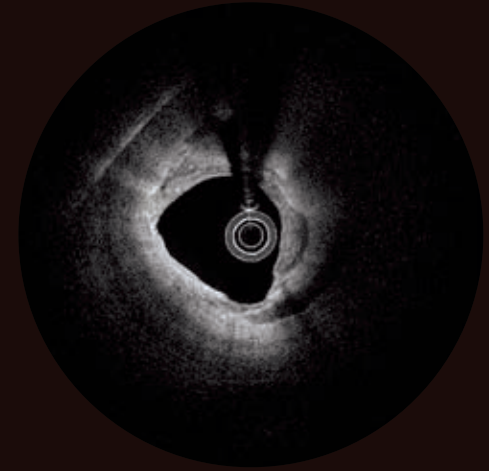
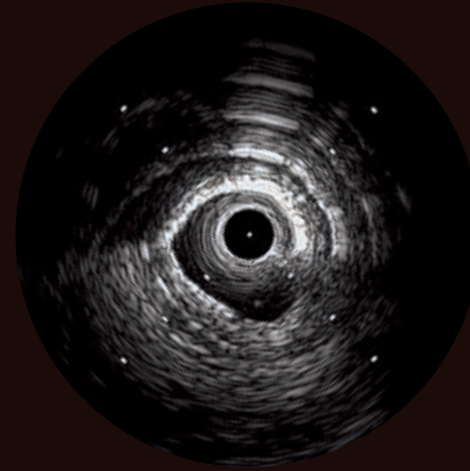
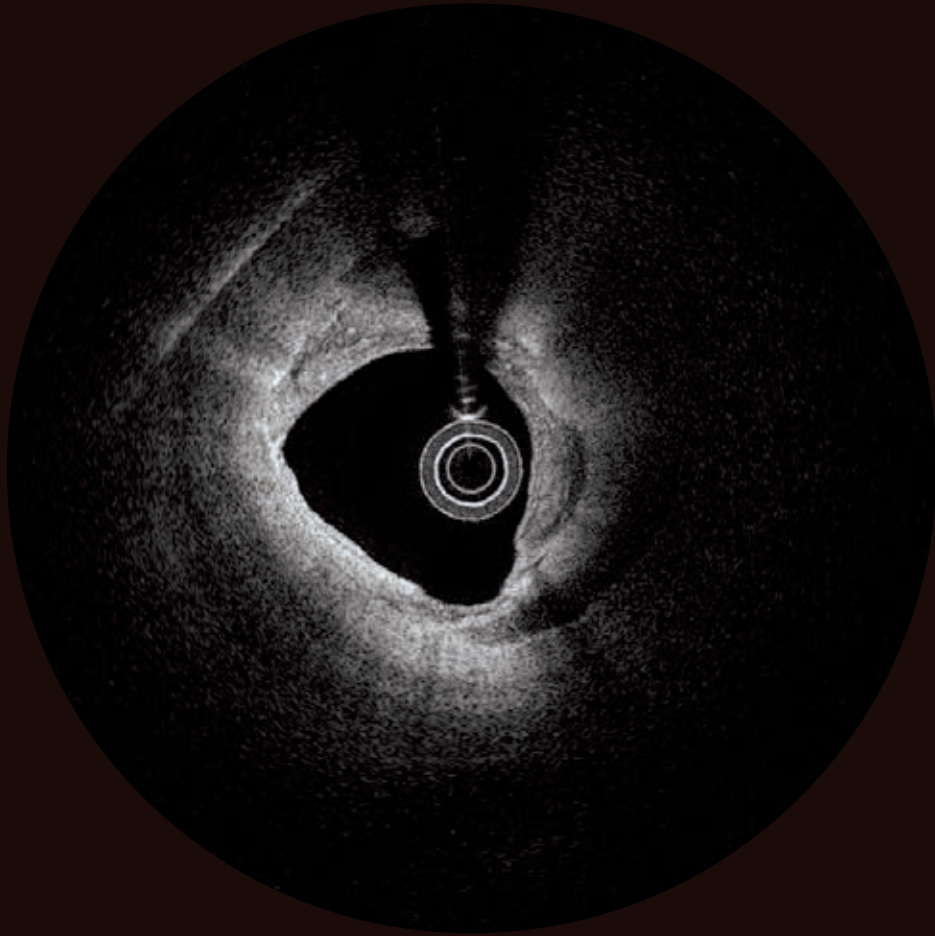


Necrotic core is observed underneath superficial calcification. This case also shows typical calcification indication of OFDI; clear boarder, but with attenuation in depth.

石灰化の深部に壊死性コアを認める(赤丸)。本症例もOFDIで石灰化の典型的所見である境界明瞭な表層が描出されるが、深部に減衰がみられる。

#31

#31 Intra-plaque hemorrhage

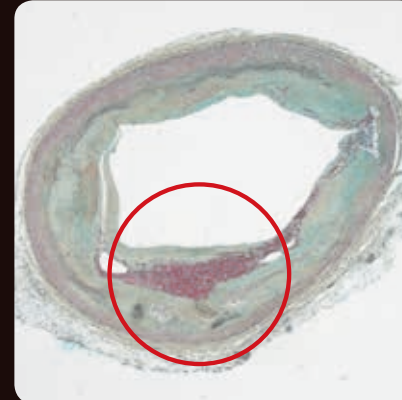
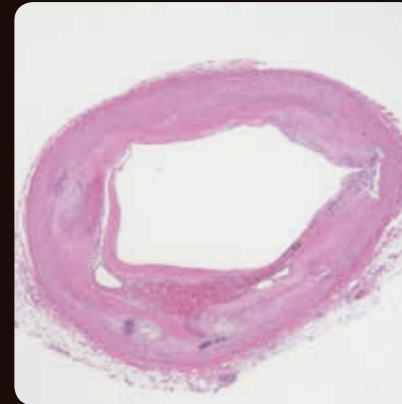
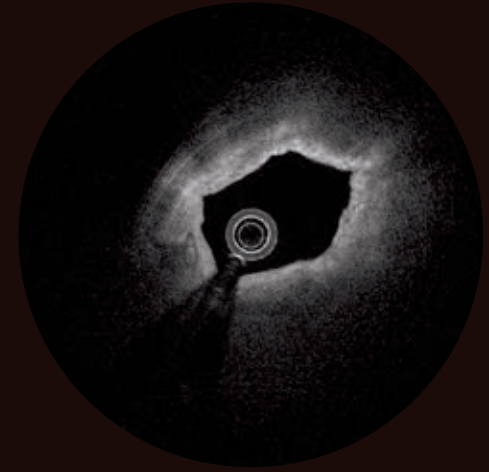
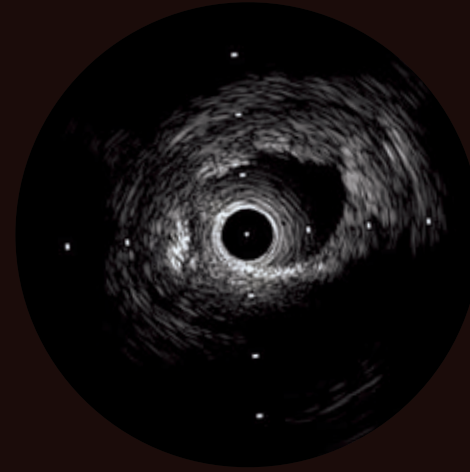
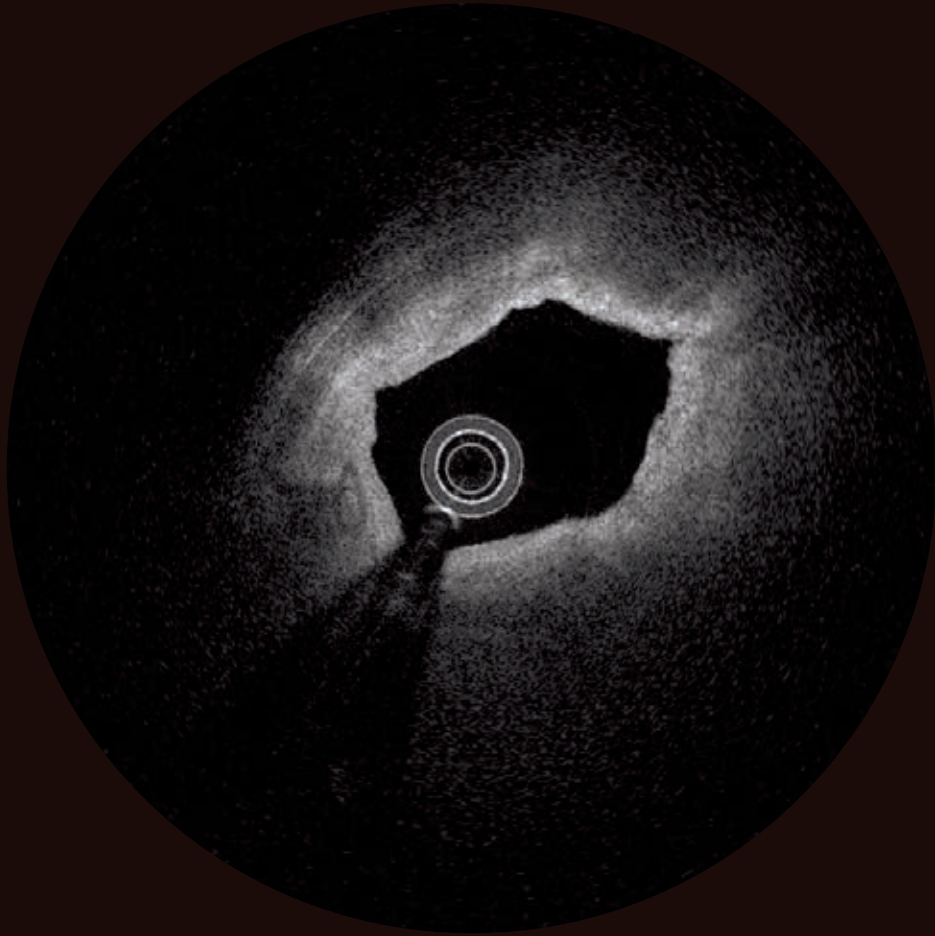


Intra-plaque hemorrhage is found at 3-5 o'clock. In this case, OFDI visualizes with Low signal, Low attenuation, and homogeneous.

3-5時の位置 (赤丸) にプラーク内出血を認める。本症例では弱い信号強度、軽度な減衰、内部均一な画像が描出される。

#32

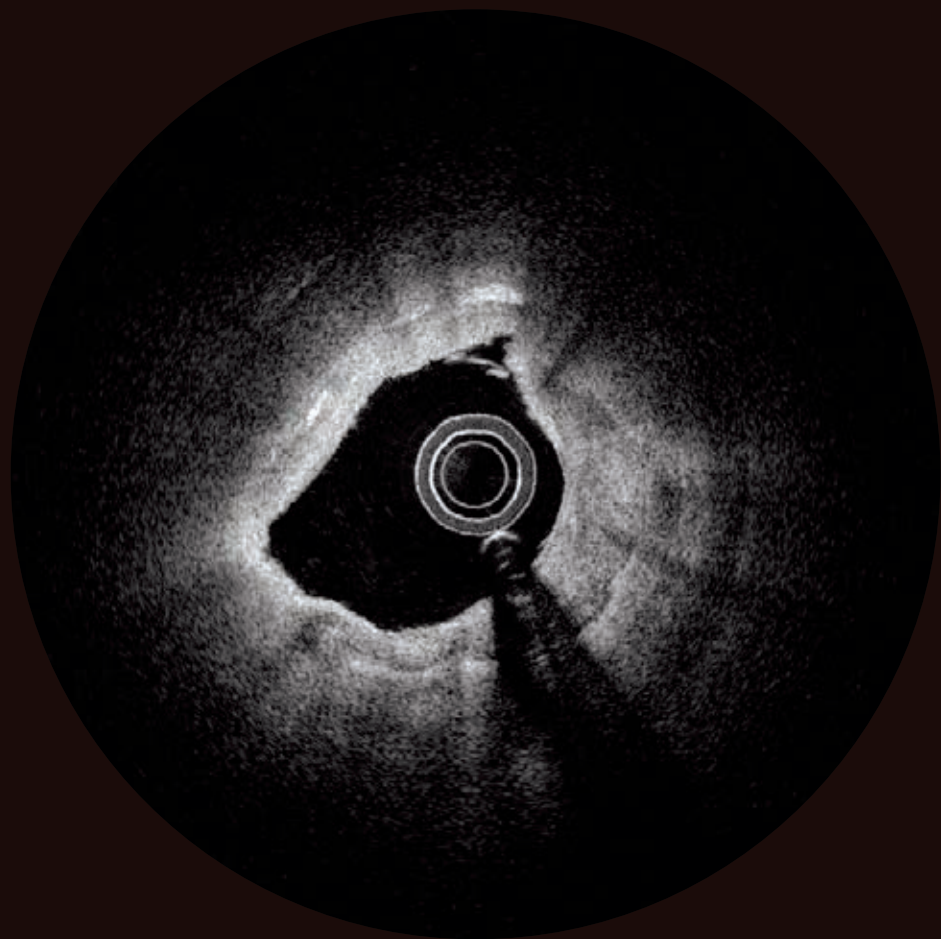
#32 Intra-plaque hemorrhage



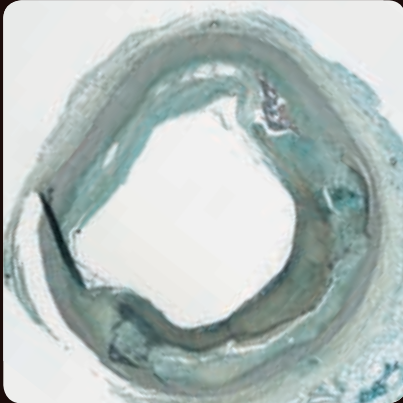
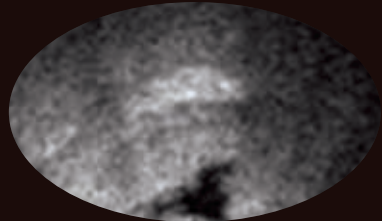
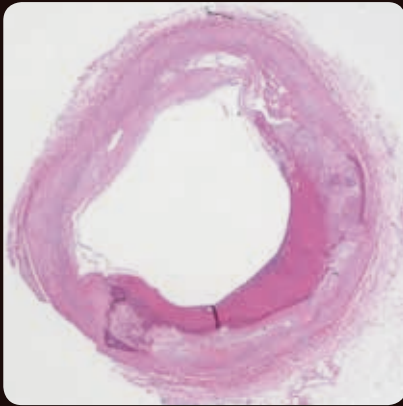
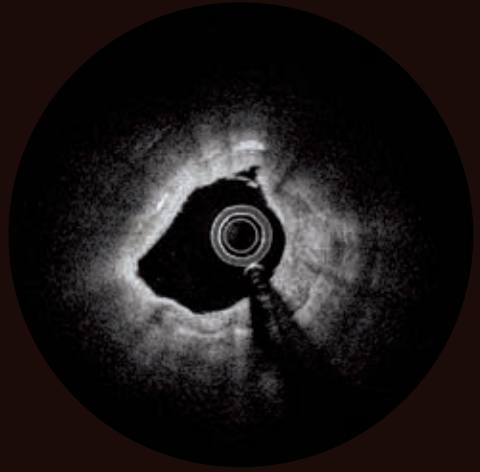
Intra-plaque hemorrhage is found at 5-6 o'clock. In this case, OFDI visualizes with Low signal, Low attenuation, and diffused border.

5-6時の位置 (赤丸) にプラーク内出血を認める。この症例では弱い信号強度、軽度な減衰、辺縁はやや不明瞭な画像が描出される。

#33



#33 Cholesterol cleft



High signal and Low attenuation OFDI finding at 10 and 12 o'clock which match with cholesterol crystal found in histology. Yet, this type of visualization seems to be limited when OFDI near infrared light is emitted perpendicular to the rod.

信号強度が強く、減衰が軽度な画像で描出される10-12時の所見は、病理解析によるコレステリン結晶の所見と一致する。ただし、このような描出はOFDIの近赤外光がロッドに対して垂直に入射した場合のみに限られる。