«ICSI Procedure and advanced techniques in medically-assisted procreation»

A.Y. 2023 - 2024

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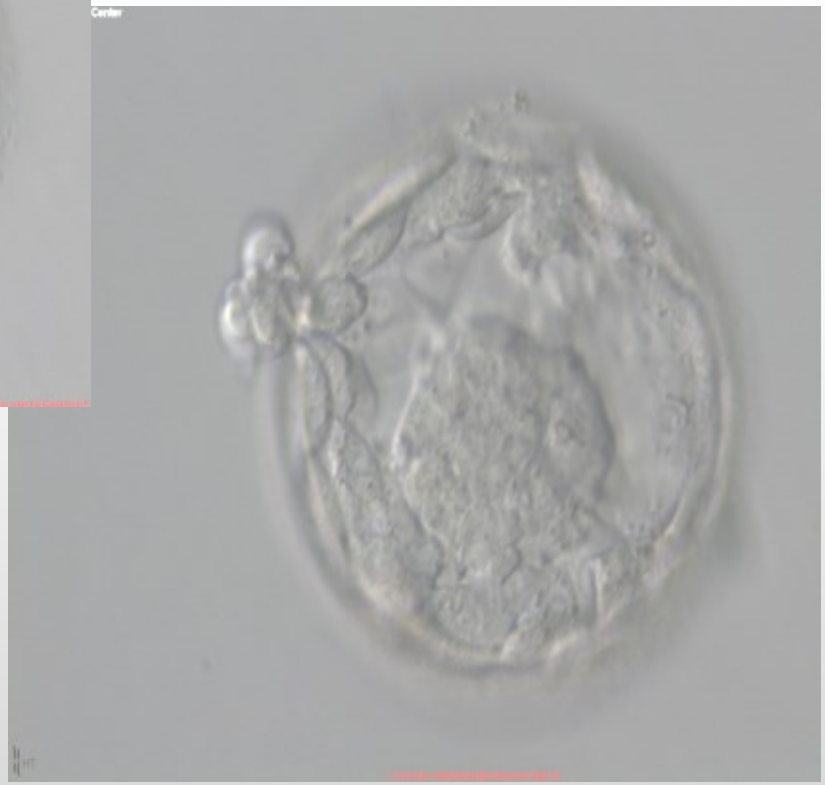
MAIN TOPICS

"ATLAS OF HUMAN EMBRYOS"

YOU HAVE TO CHOOSE!!!.....



INTERACTIVE LESSON

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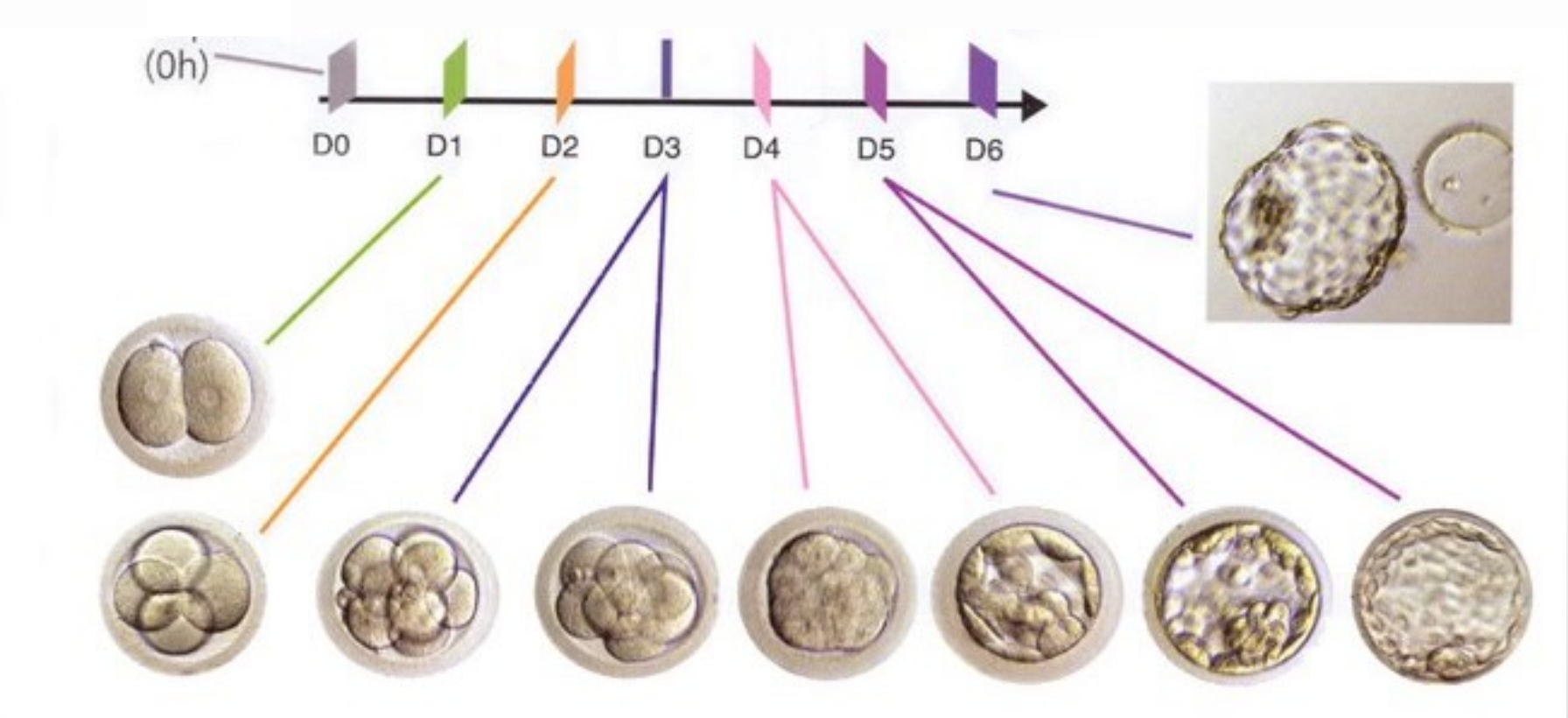
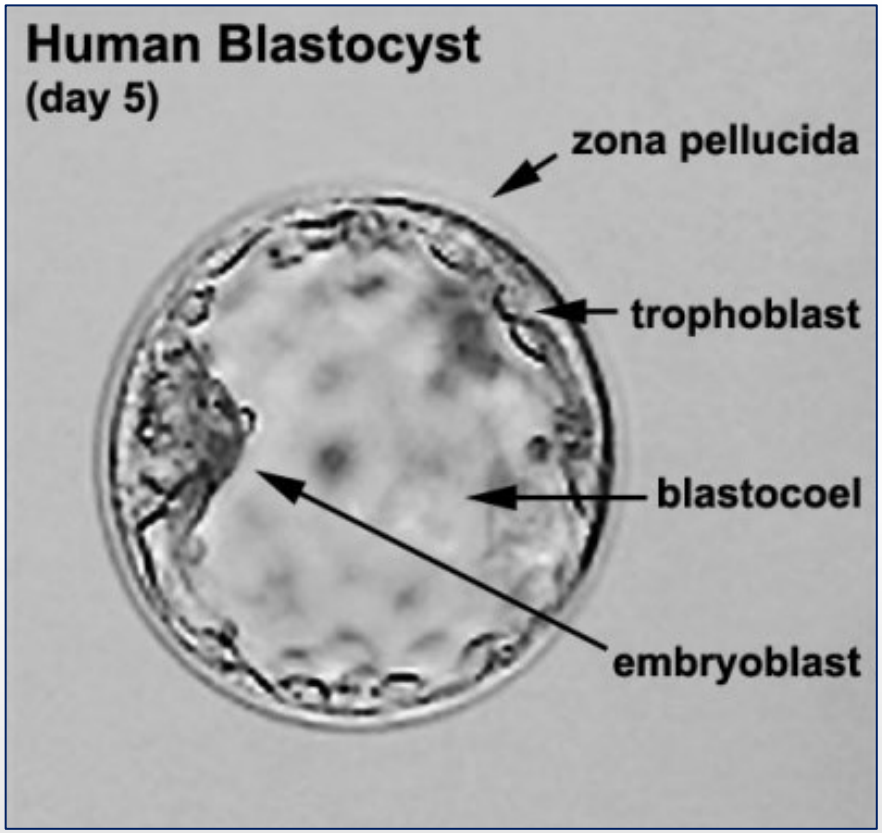
EMBYO DEVELOPMENT



A defining moment in embryonic development is when fluid starts to accumulate between cells at the morulae stage of development. As the fluid's volume increases, a cavity appears gradually forming the blastocoel.

BLASTOCYST DEVELOPMENT



As the fluid inside the newly formed blastocyst increases, so does the number of cells, and the combination of these two features causes a progressive enlargement of the blastocyst and it's cavity with a consequent progressive thinning of the zona pellucida (ZP).

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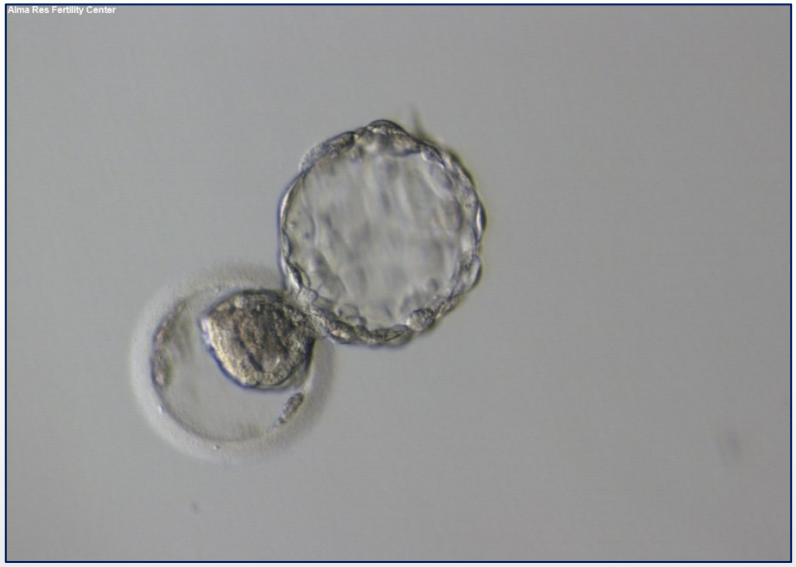
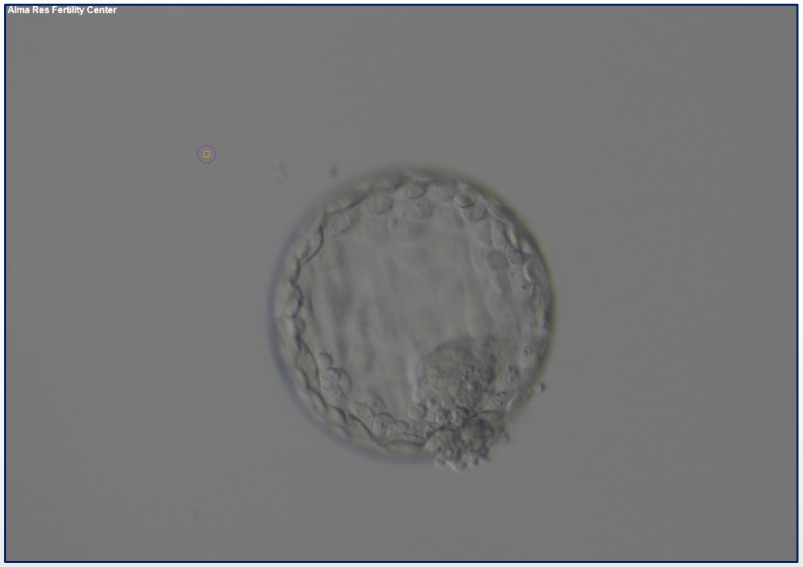
BLASTOCYST DEVELOPMENT





Finally, the blastocyst breaks free of the ZP through a process called hatching.

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BLASTOCYST DEVELOPMENT

EmbryoScope Embryo Development - Blastocyst

https://www.youtube.com/watch?v=W4pVICcRtxQ

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GARDNER BLASTOCYST GRADING SYSTEM

The Gardner blastocyst grading system assigns 3 separate quality scores to each blastocyst embryo:

1. Blastocyst development stage - expansion and hatching status
2. Inner cell mass (ICM) score, or quality
3. Trophectoderm (TE) score, or quality

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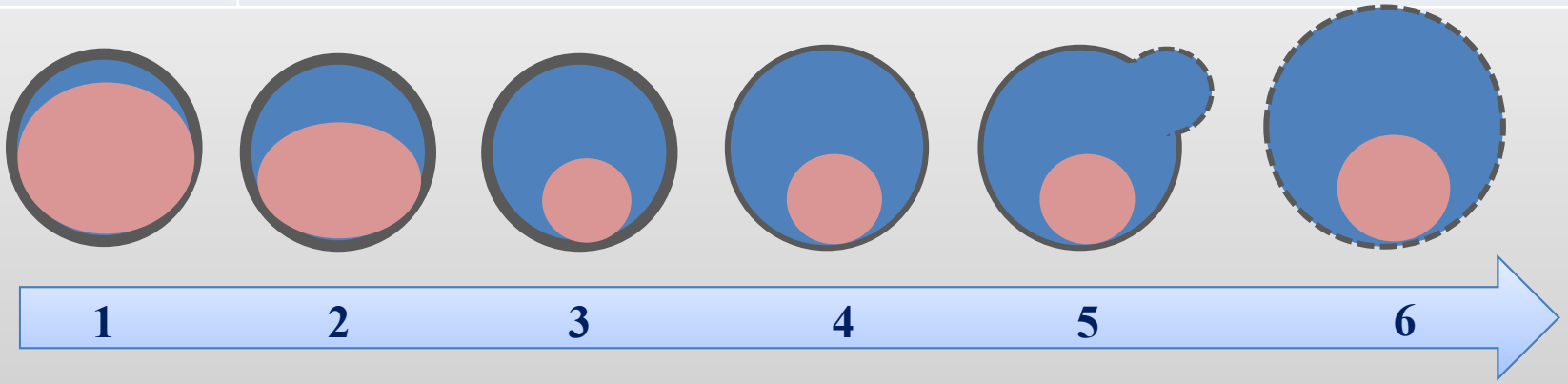
GARDNER
BLASTOCYST GRADING SYSTEM

Expansion grade	Blastocyst development and stage status
1	Blastocoel cavity less than half the volume of the embryo
2	Blastocoel cavity more than half the volume of the embryo
3	Full blastocyst, cavity completely filling the embryo
4	Expanded blastocyst, cavity larger than the embryo, with thinning of the shell
5	Hatching out of the shell
6	Hatched out of the shell



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GARDNER
BLASTOCYST GRADING SYSTEM

Once the blastocyst has reached an expansion grade of 3 or more, a clear distinction can be made between the two newly formed cell populations:

The outer cells of the blastocyst, forming the blastocyst structure itself are called the **TE** cells. The destiny of the TE is to become associated extra-embryonic structures.

The cells located inside the blastocoel, often forming a cell clump at one pole of the blastocyst, are called the **ICM** cells. The destiny of the ICM is to become the embryo proper.

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GARDNER BLASTOCYST GRADING SYSTEM

ICM grade	Inner cell mass quality
A	Many cells, tightly packed
B	Several cells, loosely grouped
C	Very few cells

TE grade	Trophectoderm quality
A	Many cells, forming a cohesive layer
B	Few cells, forming a loose epithelium
C	Very few large cells

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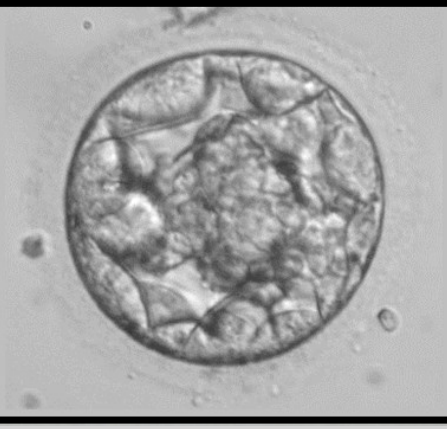
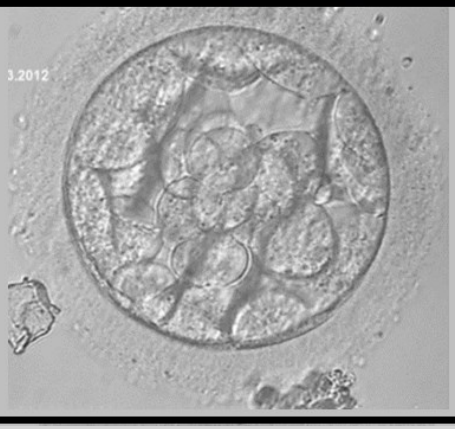
Inner Cell Mass (ICM)	***A*** *Numerous and tightly packed*	***B*** *Several and loosely packed cells*	***C*** *Few cells*
Trophectoderm (TE)	***A*** *Many tightly packed cells organised into epithelium*	***B*** *Several cells organised into loose epithelium*	***C*** *Few cells*
Morula			
Early Blastocyst			

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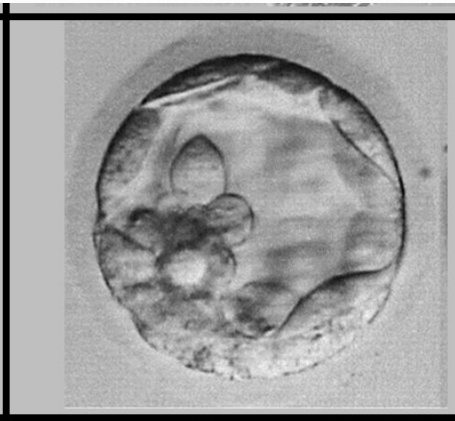
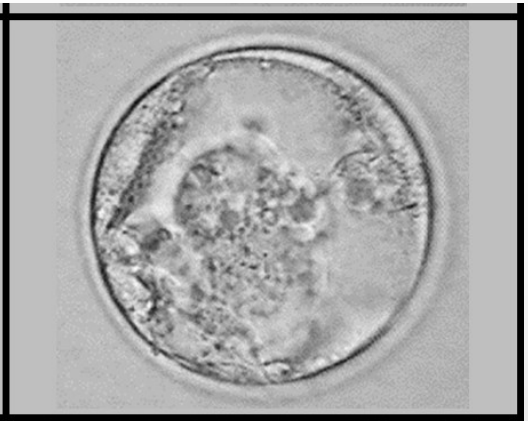
Inner Cell Mass (ICM)	***A*** *Numerous and tightly packed*	***B*** *Several and loosely packed cells*	***C*** *Few cells*
Trophectoderm (TE)	***A*** *Many tightly packed cells organised into epithelium*	***B*** *Several cells organised into loose epithelium*	***C*** *Few cells*
Blastocyst			
Expanded Blastocyst			

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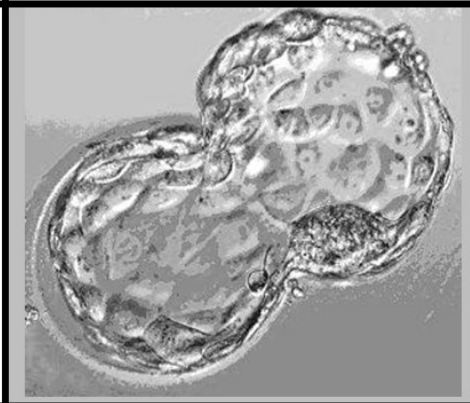
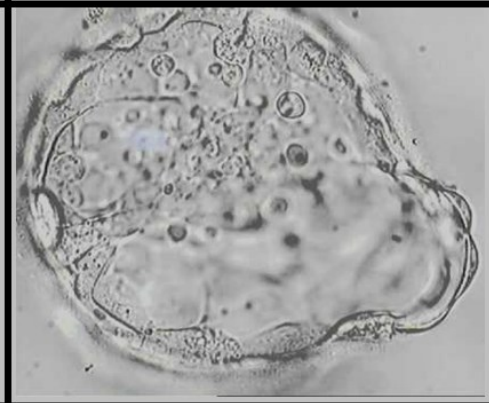
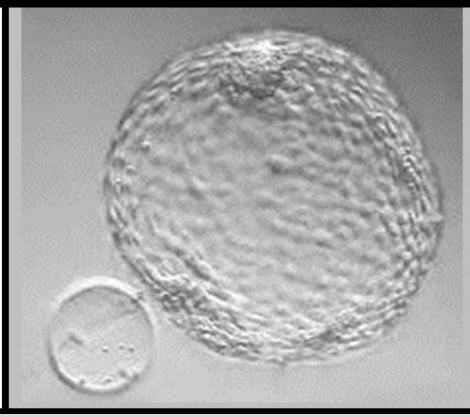
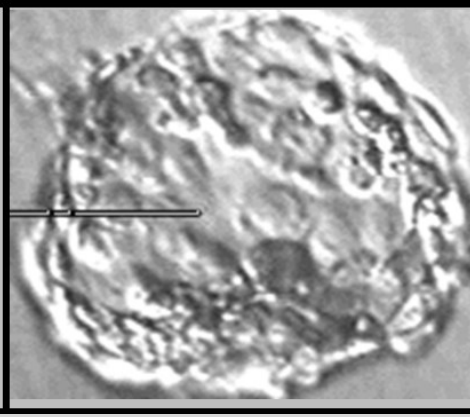
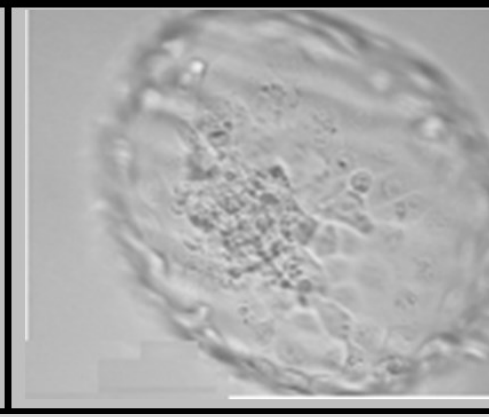
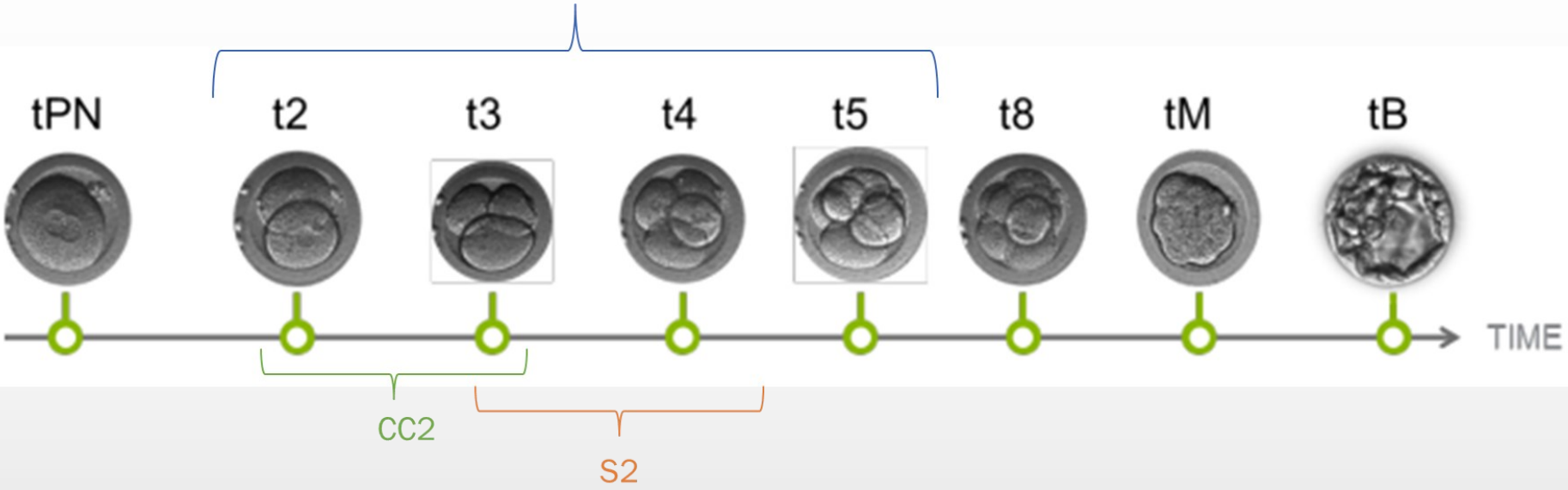
Inner Cell Mass (ICM)	***A*** *Numerous and tightly packed*	***B*** *Several and loosely packed cells*	***C*** *Few cells*
Trophectoderm (TE)	***A*** *Many tightly packed cells organised into epithelium*	***B*** *Several cells organised into loose epithelium*	***C*** *Few cells*
Hatching Blastocyst			
Fully Hatched Blastocyst			

Time-lapse technology & embryo morphokinetics



With *conventional* incubator, embryos must be taken out of the incubator to be assessed, exposing them to unnecessary stress and fluctuations. Time-lapse technology solves this problem by combining a camera system into the culture chambers allowing a continuous observation in an undisturbed culture.

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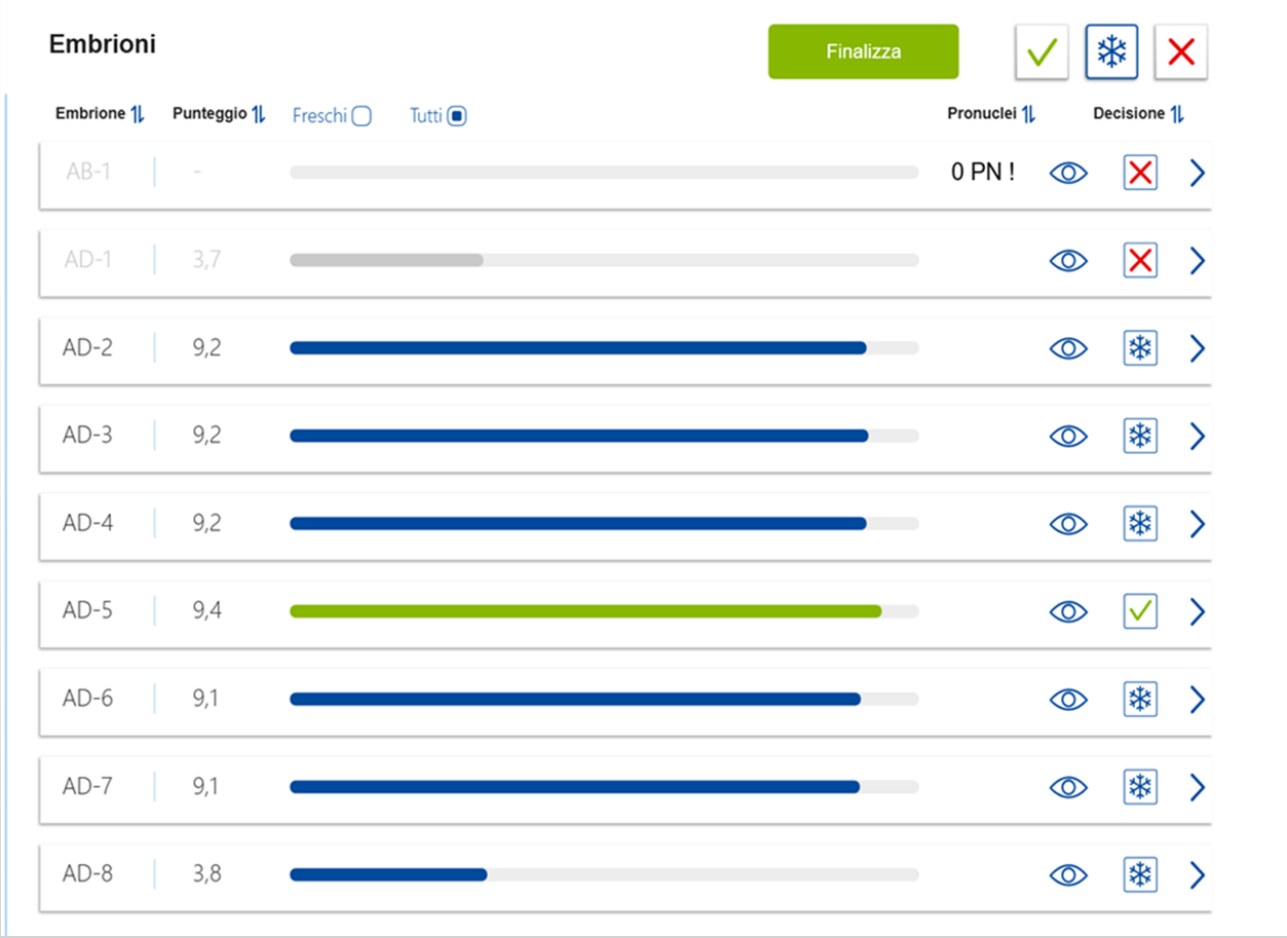
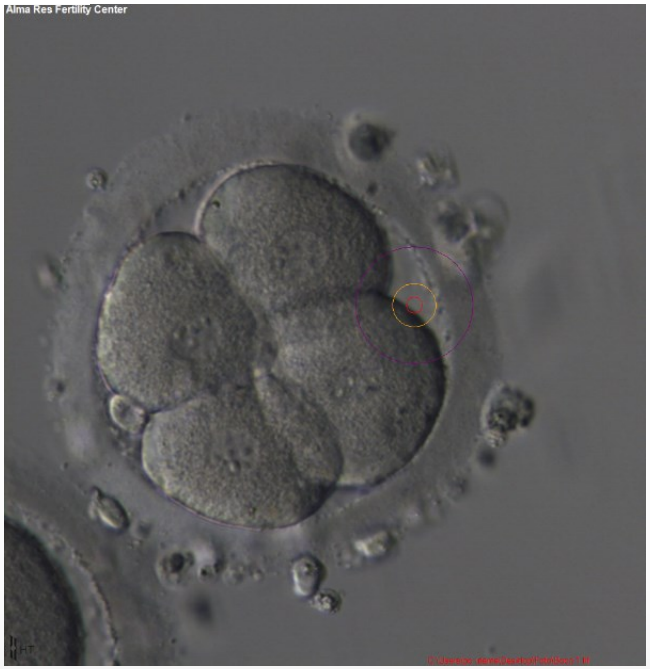
iDAScore 1.2.0 (Intelligent Data Analysis)

iDAScore is an AI-based scoring system that provides fully automated analysis of time-lapse sequences

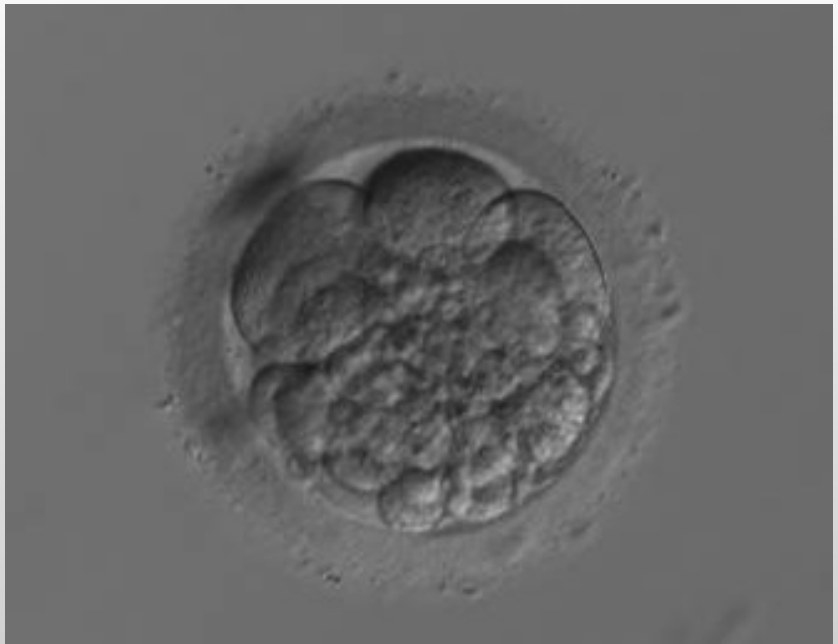




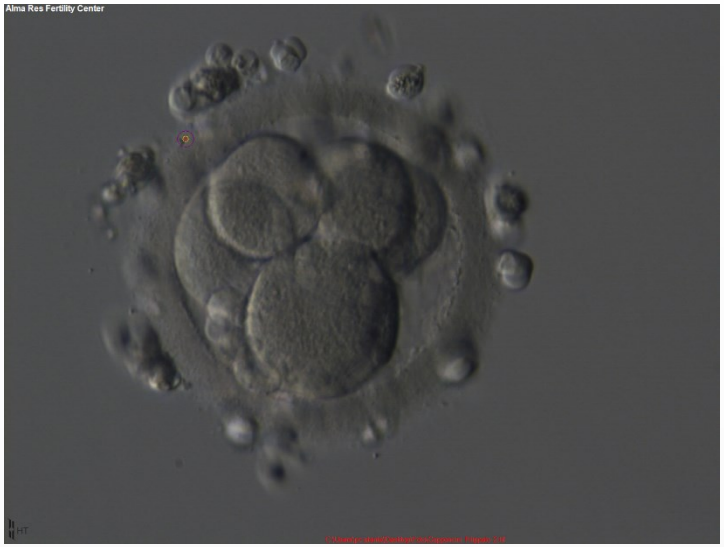
A 4-cell embryo with four evenly sized blastomeres each one containing one nucleus.

A 4-cell embryo with 15–20% fragmentation,

An 8-cell embryo with evenly sized blastomeres

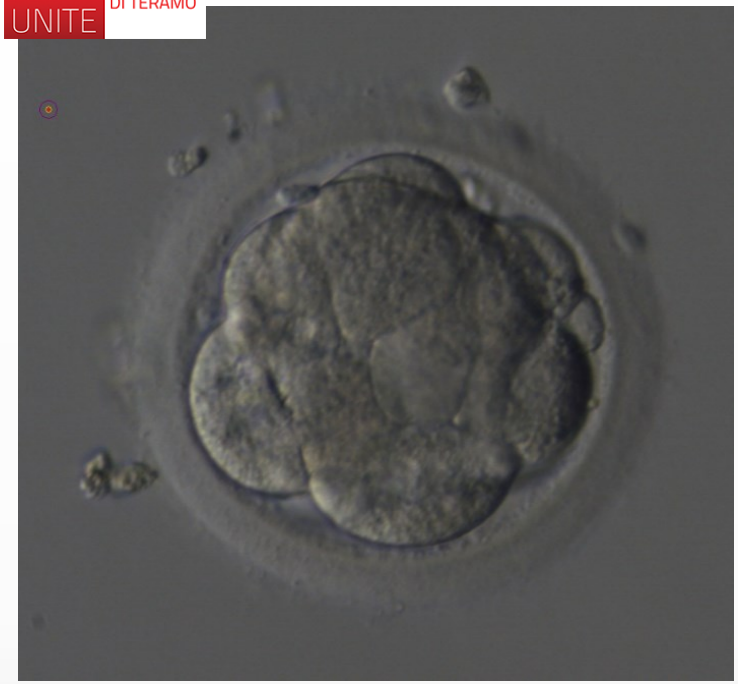


A 6-cell embryo with 30–40% fragmentation

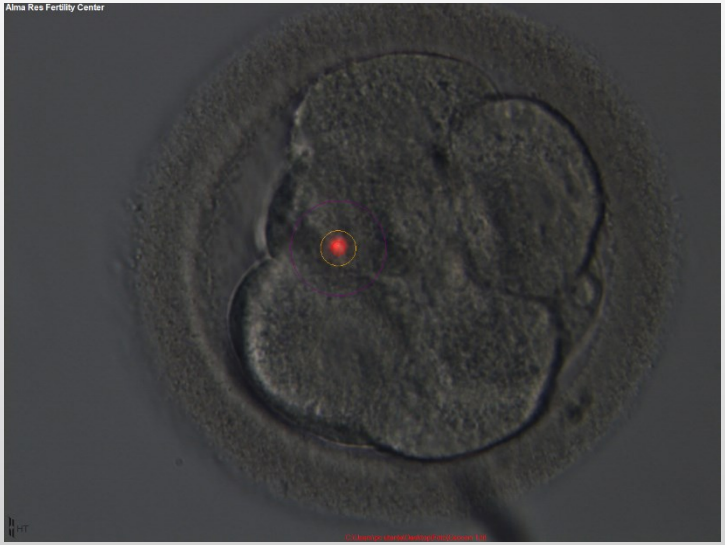


A 5-cell embryo with 15–20% scattered fragmentation and unevenly sized blastomeres

An 8-cell embryo showing signs of moderate compaction

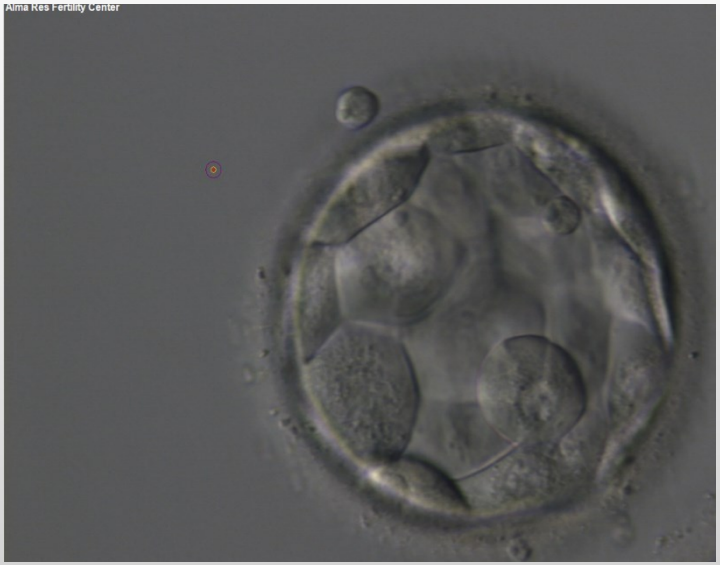


A morula of good quality. All blastomeres have been included in the compaction process and individual cells are no longer evident.



A morula of good quality. All blastomeres have been included in the compaction process and individual cells are no longer evident.

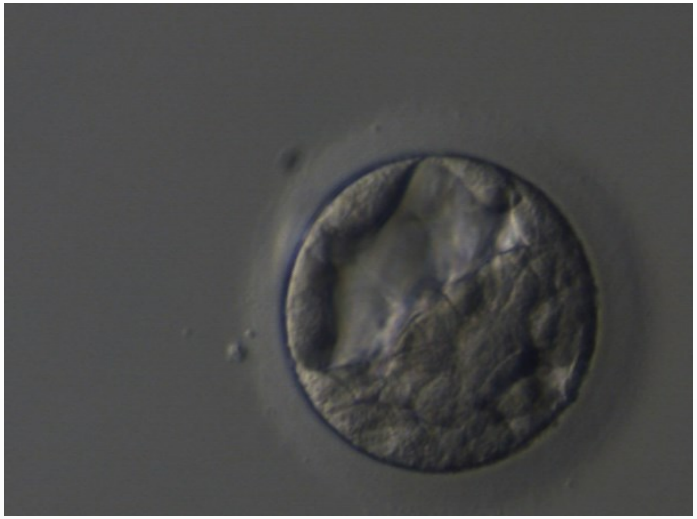
An early blastocyst with a cavity occupying < 50% of the volume of the embryo. Note the flattened squamous-like trophectoderm (TE) cells lining the right half of the cavity in this view.



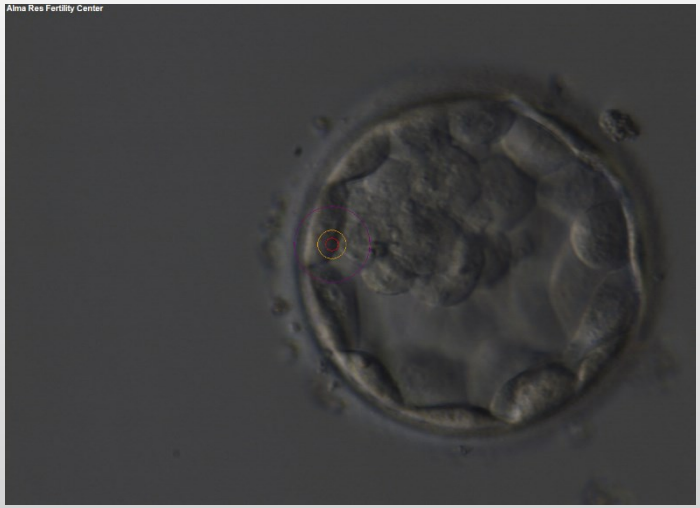
A very early blastocyst.

An early blastocyst with a cavity occupying < 50% of the volume of the embryo. Note the early formation of the outer TE cells that are beginning to be flattened against the zona pellucida (ZP).

An early blastocyst with a cavity occupying almost 50% of the volume of the embryo. Note the large flattened TE cells lining the initial blastocoel cavity.

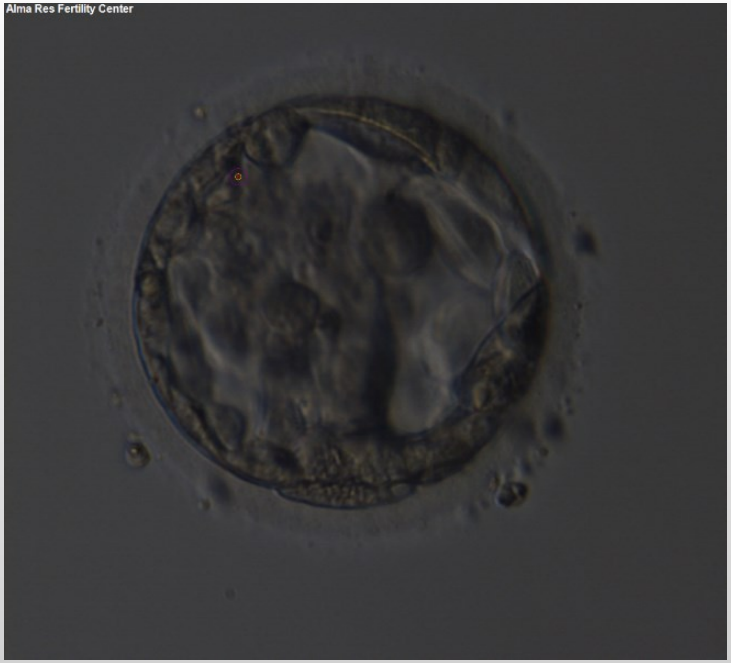


An early blastocyst with the cavity clearly visible and occupying half the volume of the embryo.

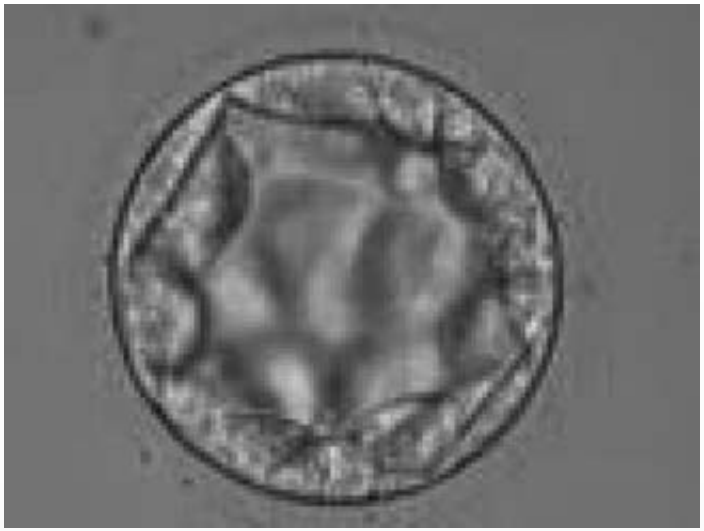


An early blastocyst with the cavity occupying > 50% of the volume of the embryo. The overall volume of the blastocyst remains unchanged with no thinning of the ZP. The early ICM can be seen on the left half of the blastocyst in this view.

Blastocyst (Grade 3:A:A) showing a compact ICM.

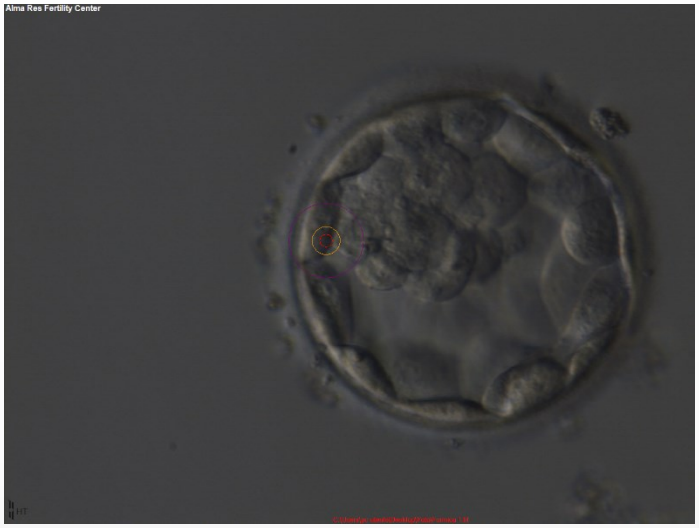


Blastocyst (Grade 3:B:A) showing a cavity occupying the total volume of the embryo**.** The ICM can be seen at the 11o'clock position.

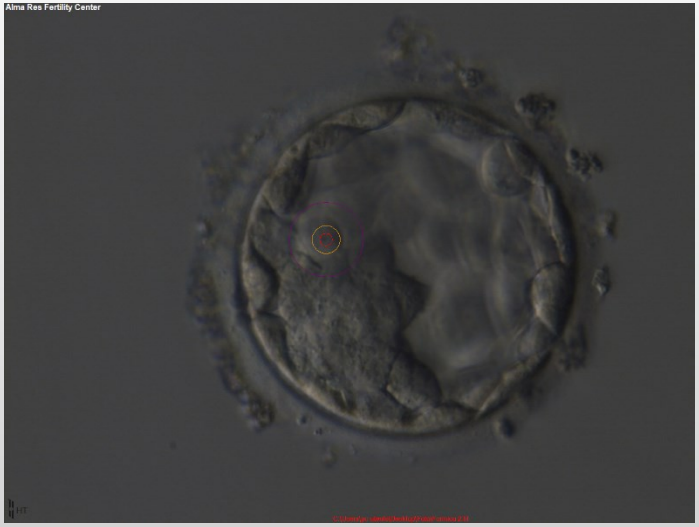


Blastocyst (Grade 3:C:B) with no clearly identifiable ICM and TE cells that in places are quite large and stretch over great distances to reach the next cell

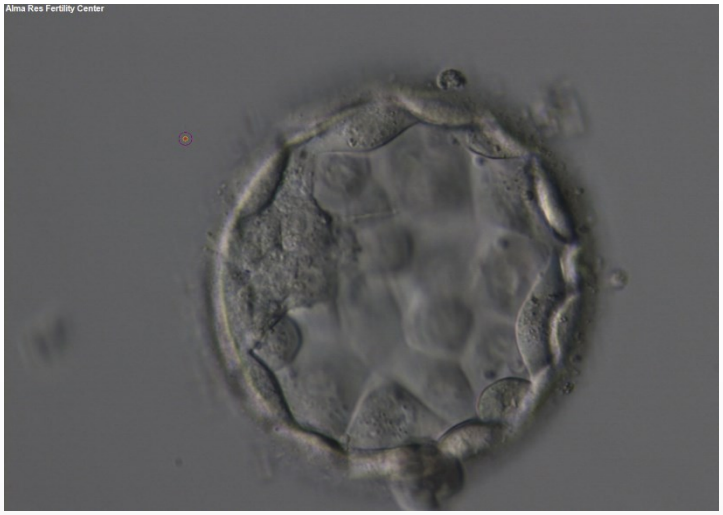
Blastocyst (Grade 3:A:A) showing a very large ICM at the 10 o' clock position in this view. The ICM is made up of many cells that are tightly compacted.



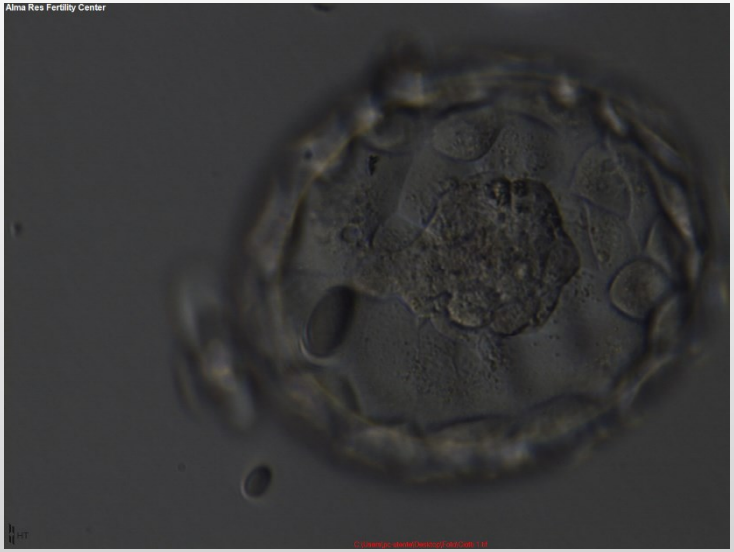
Blastocyst (Grade 3:A:A) with a dense ICM clearly visible at the 11 o'clock position in this view. The TE cells are variable in size but form a cohesive epithelium.



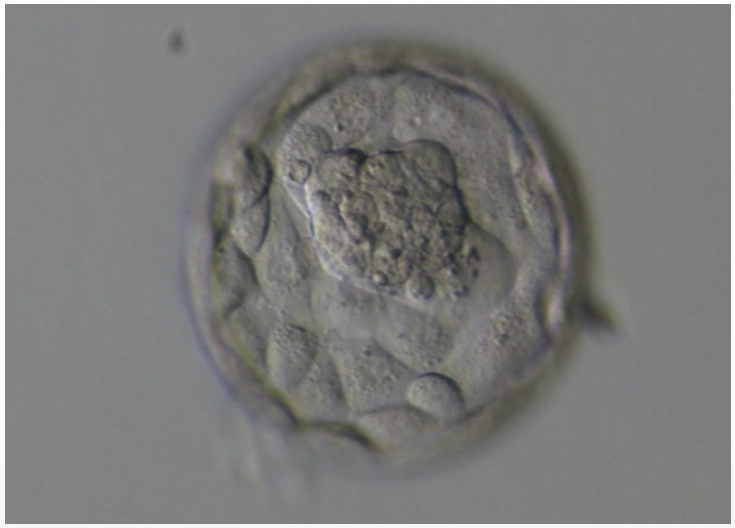
Blastocyst (Grade 3:A:A) with a dense ICM clearly visible at the base of the blastocyst in this view.



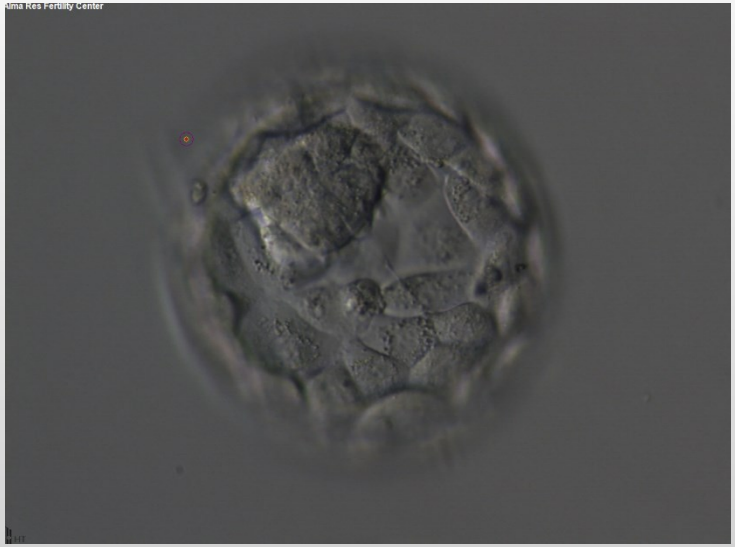
Expanded blastocyst (Grade 4:A:A) showing a large ICM made up of many cells that are tightly compacted.



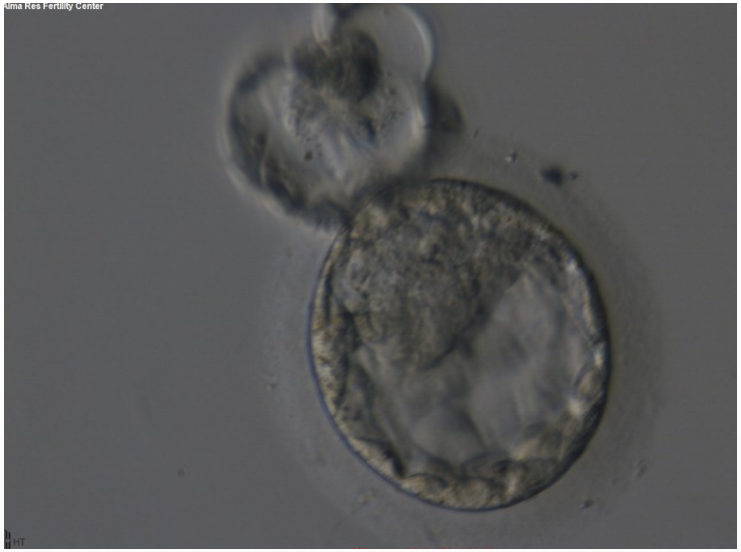
Good quality expanded blastocyst (Grade 4:A:A) with a large ICM**.** The blastocyst is now a greater volume than the original volume of the embryo and the ZP is thinned. There appears to be cytoplasmic strings extending from the ICM to the TE**.**



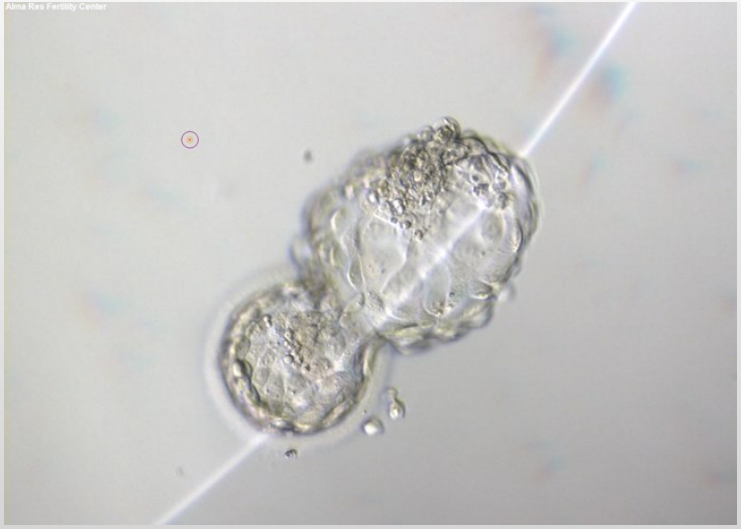
Expanded blastocyst (Grade 4:A:A) showing a large ICM**.** The ICM is made up of many cells and is very compact. The blastocoel cavity is now larger than the original volume of the embryo and the ZP is very thin.



Expanded blastocyst (Grade 4:A:A) showing a large ICM at the top of the blastocyst in this view. There are very many TE cells forming a cohesive epithelium that lines the enlarged blastocoel cavity. The ZP is very thin.

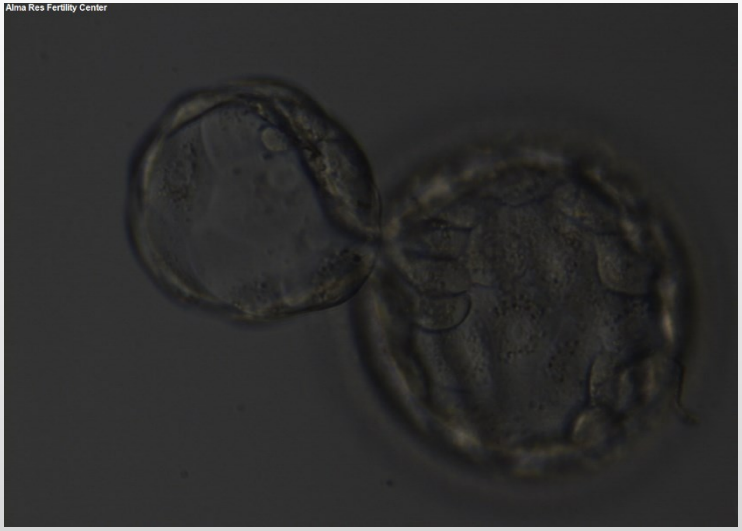


Hatching blastocyst (Grade 5:A:A) showing a large, compact, crescent-shaped ICM retained within the ZP at the 12 o'clock position in this view. There are very many TE cells and almost 25% of the blastocyst has herniated out through a breach in the ZP at the 11 o'clock positions in this view.

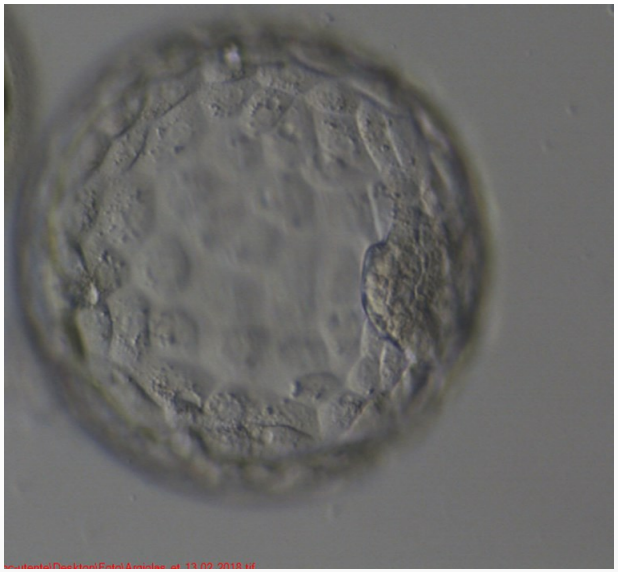


Hatching blastocyst (Grade 5:B:A) showing a small ICM being drawn out along with the herniating TE cells at the 1 o'clock position in this view. There are very many TE cells of similar size lining the blastocoel cavity and the ZP is thinned.

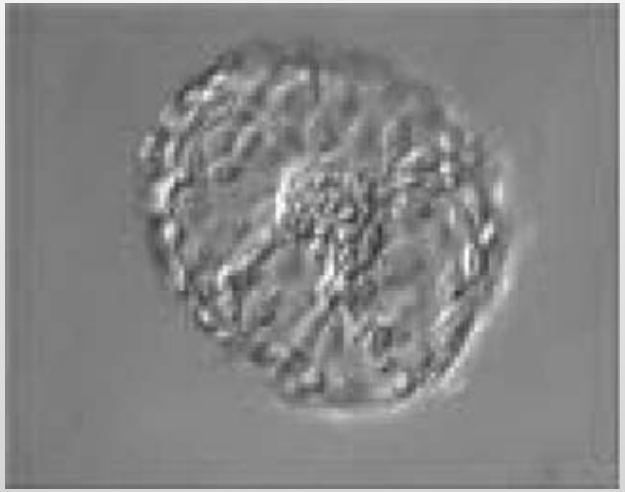
Hatching blastocyst (Grade 5:A:A) showing a large, compact ICM at the 12 o'clock position in this view. There are many TE cells of equivalent size lining the blastocoel cavity and several TE cells are herniating through a breach in the thinned ZP at the 9 o'clock position in this view.



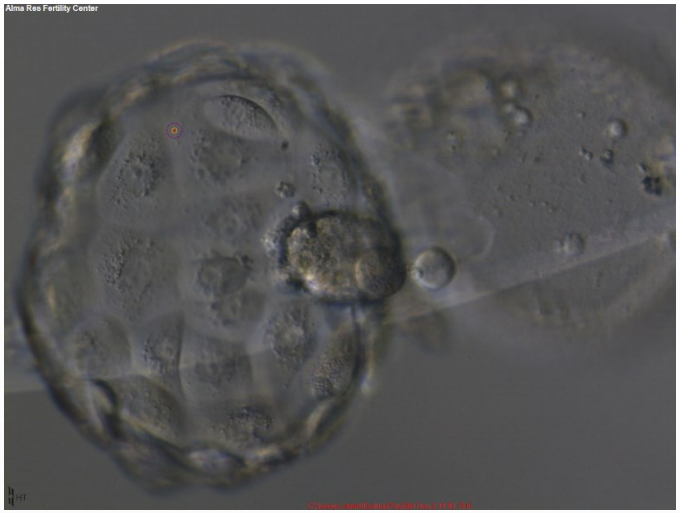
Hatching blastocyst (Grade 5:A:A) Approximately 25% of the blastocyst has herniated from a breach in the thinned ZP at the 10-11 o'clock positions in this view.



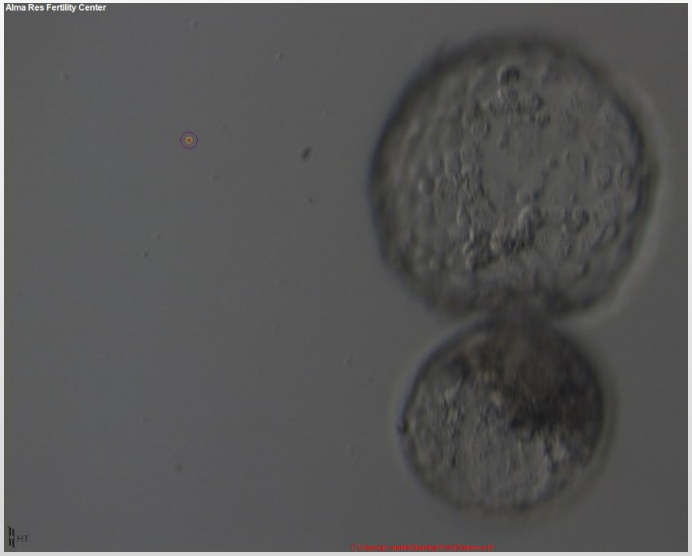
Hatched blastocyst (Grade 6:A:A) that is now completely free of the ZP showing a compact ICM at the 3 o'clock position in this view. The ICM appears to be connected or anchored to the TE by a broad triangular bridge. The TE cells form a cohesive epithelium. The blastocyst is now more than twice the size of the original expanded blastocyst.



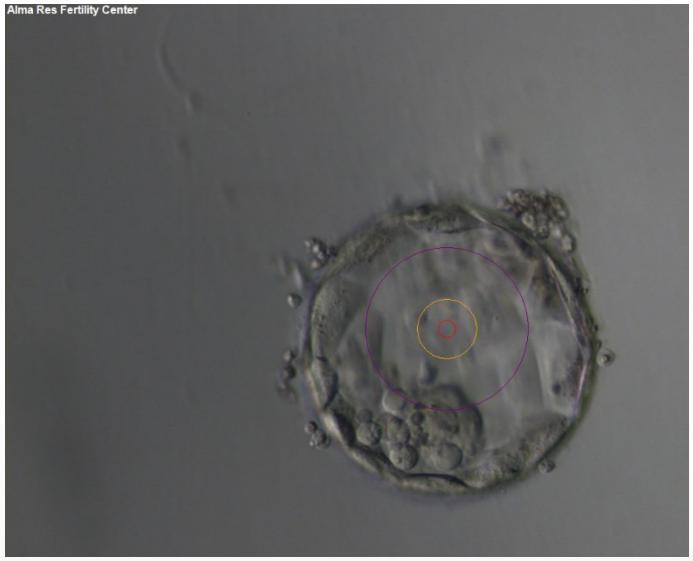
Hatched blastocyst (Grade 6:A:A) that is now completely free of the ZP. The ICM positioned centrally at the base of the blastocyst appears to be connected or anchored to the TE by several bridges. There are very many TE cells of similar size forming
a cohesive epithelium..



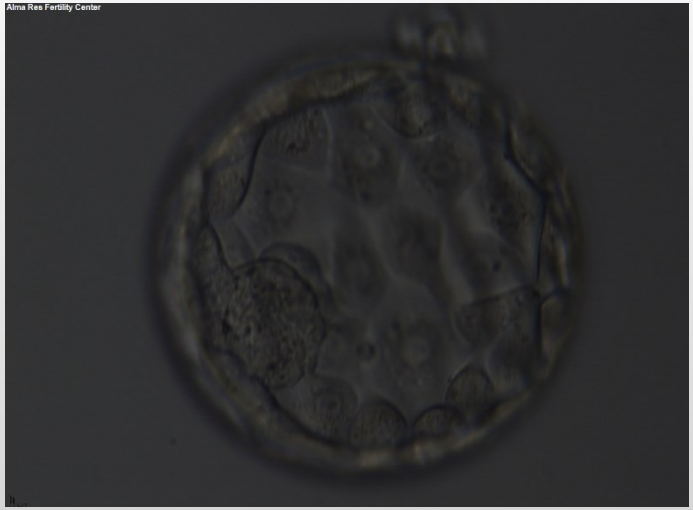
Hatched blastocyst (Grade 6:A:A) that is now only just free of the ZP. The ICM is large and compact at the base of the blastocyst. The TE is similarly made up of many cells forming a cohesive epithelium. There is some cellular debris discarded in the ZP.



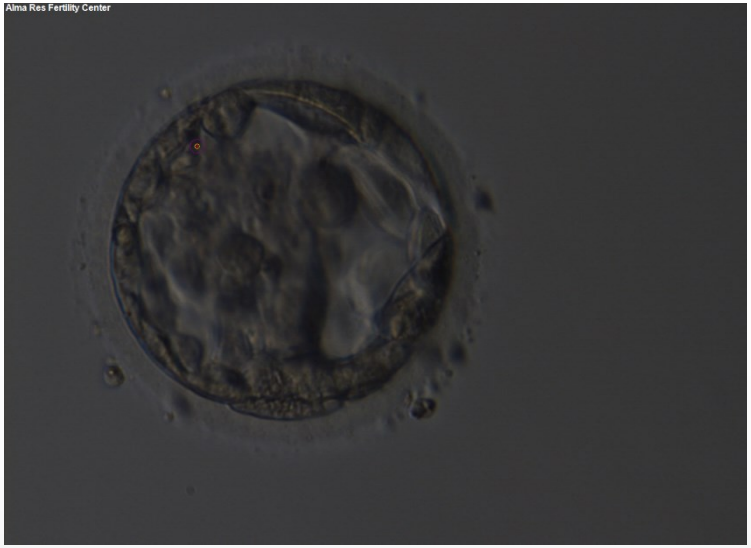
Hatched blastocyst (Grade 6:A:A) that is now completely free of the ZP which can be seen in the same view. Some cellular debris remains behind in the empty ZP. There are many TE cells making up a cohesive epithelium. In this view, it is possible to clearly see the increase in diameter of the blastocyst from the diameter of the original embryo which was accommodated within the ZP



Blastocyst (Grade 3:B:A). showing a compact ICM at the 6 o'clock position in this view. The ICM is small relative to the diameter of the blastocyst and probably made up of few cells.

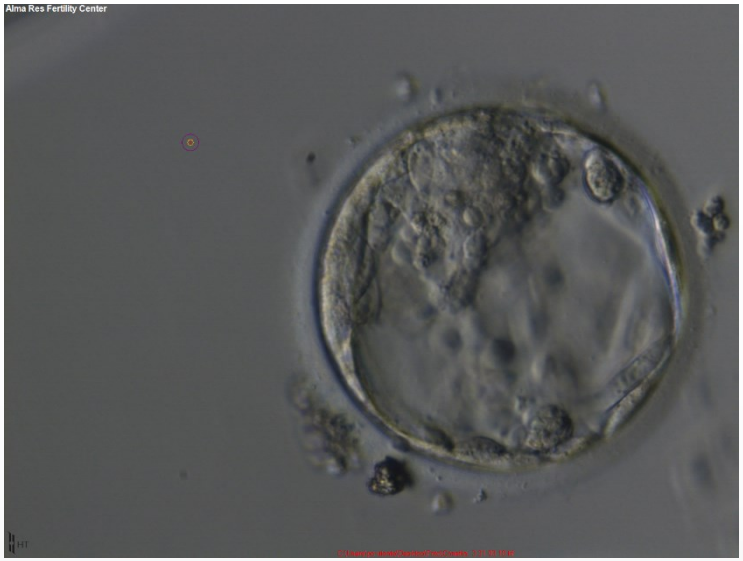


Hatching blastocyst (Grade 5:B:A) showing a compact ICM toward the 8 o'clock position in this view. The ICM is very small and made up of few cells relative to the size of the blastocyst.



Blastocyst (Grade 3:C:B) with no clearly identifiable ICM and with TE cells that in places are quite large and stretch over great distances to reach the next cell.

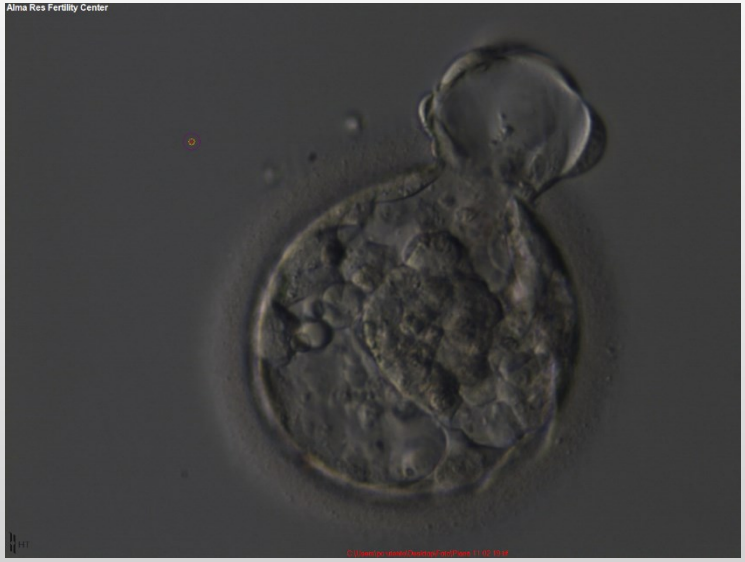
Hatching blastocyst (Grade 5:B:A) showing a compact ICM at the 9 o'clock position in this view. The ICM is small and flattened and made up of few cells relative to the size of the blastocyst.



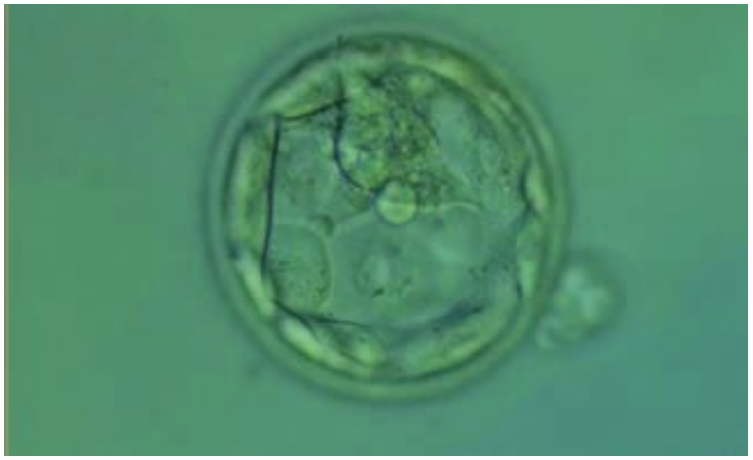
Blastocyst (Grade 3:C:C) with no clearly identifiable ICM and sparse TE that does not form a cohesive epithelium.

Expanded blastocyst (Grade 4:C:C) with no clearly identifiable ICM. TE is made up of a few, sparse cells that do not form a cohesive epithelium.

Hatching blastocyst (Grade 4:C:A) with no clearly identifiable ICM but a TE that is made up of many cells forming a cohesive epithelium. Dark, degenerate cells are present toward the 12 o'clock position in this view.



Hatching blastocyst (Grade 5:A:B). The TE cells vary in size with some cells quite large forming a loosely cohesive epithelium. The ICM can be seen at the 3 o'clock position in this view.

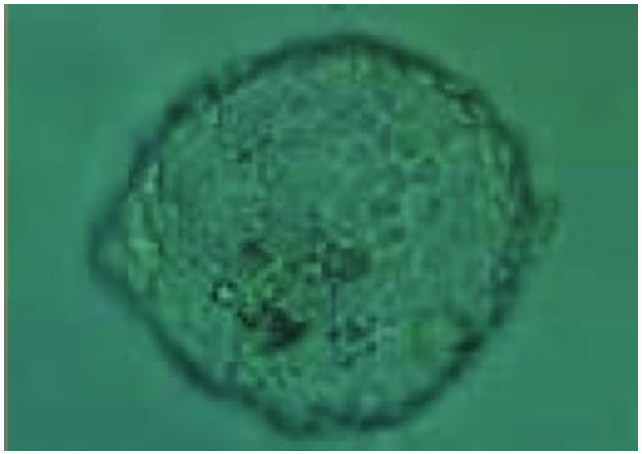


Hatching blastocyst (Grade 5:A:B) with few TE cells that form a loosely cohesive epithelium, and with a mushroomshaped ICM at the 12 o'clock position in this view.

Early hatching blastocyst (Grade 4:A:C) with a very sparse TE that does not form a cohesive epithelium. The ICM is visible at the 10 o'clock position in this view.

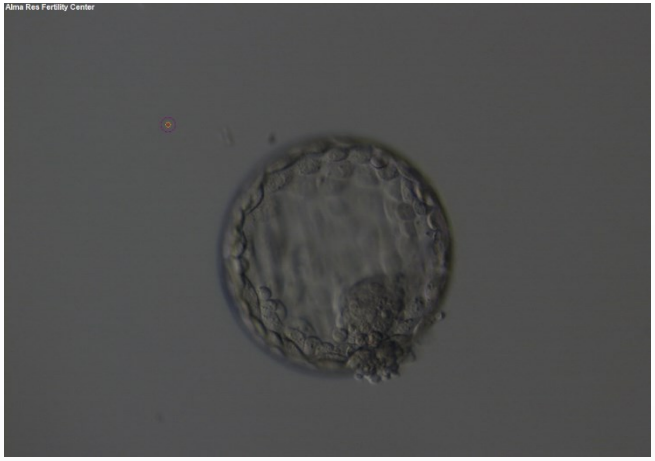
Blastocyst (Grade 3:C:C) with sparse TE that does not form a cohesive epithelium. The ICM is not clearly identifiable.

Expanded blastocyst (Grade 4:C:C) with sparse TE that does not form a cohesive epithelium. The ICM is hardly distinguishable despite the expansion of the blastocoel cavity.



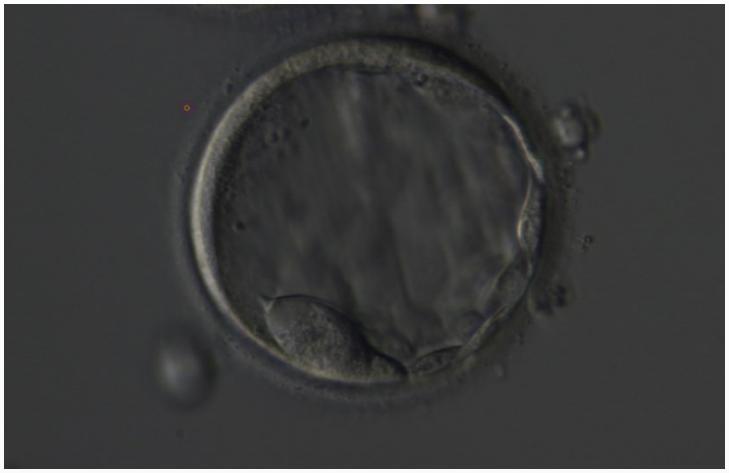
Hatched blastocyst (Grade 6:A:A) showing many cells in the TE making a cohesive epithelium. Many of the TE cells contain dark granules. The ICM is not clearly seen in this view and there are several degenerative foci (dark cells) associated with the ICM and polar TE.

Early blastocyst (Grade 2) in which the ICM is not as yet clearly discernible. Many of the TE cells contain dark granules. In addition there is a large number of small fragments which can be best seen between the 8 and 9 o'clock positions in this view.



Hatching blastocyst (Grade 5A:A) showing a compact ICM at the 6 o'clock position which is associated with several cellular fragments. The TE is made up of many cells that form a cohesive epithelium.

Early blastocyst (Grade 2) with large vacuolization of the TE distinct from the blastocoel cavity at the 10 o'clock position
in this view.



Blastocyst (Grade 4:B:C) with a very sparse TE that does not form a cohesive epithelium. The ICM is visible at the 6 o'clock position in this view.

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