TECHNOLOGY

The Applebaum score: how ultrasound a nd Doppler show whether the uterus is ready for embryo transfer

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Successful implantation depends not only on the embryo but also on the endometrium and the bloo d supply to the uterus. We explain what the Applebaum score assesses, what the research says and how we use it at the clinic.

When an embryo fails to implant, its quality is often the first suspect. But the success of a transfer also depends on how ready the uterus is to receive it: on the state of the endometrium, the muscular wall an d the blood supply. The Applebaum score helps assess this in advance. It is a points system based on a standard transvaginal ultrasound with Doppler.

What the Applebaum score is

The score was proposed by M. Applebaum in 1995 (Ultrasound Obstet Gynecol, 5(1):67–68). It has si nce been used under two names: the Uterine Biophysical Profile (UBP) and the Uterine Scoring System f or Reproduction (USSR).

he idea is simple: instead of a single figure, such as endometrial thickness, the doctor looks at several fe atures at once and combines them into an overall score. The more favourable the conditions, the higher the score. It is used in IVF and ICSI cycles, in frozen embryo transfers and in stimulated intrauterine inseminat ion (IUI) cycles.

What exactly is assessed

he score brings together seven features, which fall neatly into three groups.

The seven signs of the Applebaum score in three groups; blood flow carries the most weight.

Endometrium

hickness and layering. A happy medium works best, roughly 10–14 mm: an endometrium that is too thin i s poorly prepared, while one that is too thick is not considered ideal either. A clear five-line (layered) pa ttern is a good sign; a blurred or absent one is less favourable.

etrium

How often the muscular wall contracts over a few minutes of observation, and how uniform its structure is: smooth, even tissue is better than coarse, uneven tissue.

Blood flow

The most heavily weighted group. The doctor assesses resistance in the uterine arteries (the pulsa tility index, PI), blood flow within the endometrium itself (“zone 3” on the score) and blood flow in the myo metrium. The better the blood flow, the more favourable the outlook. In several studies, endometrial blood flow and uterine artery PI were the features most closely linked to pregnancy.

When the assessment is done

he score is usually calculated before embryo transfer: on the day of transfer or at a trial scan beforehand, and in frozen embryo cycles on the day of thawing. Sometimes the middle of the cycle is assessed as well. The state of the uterus changes over the cycle, so the date of the scan and the cycle day are always re corded in the report.

What the research says

- In the study by Khan et al. (2016), almost every woman with the maximum score became pregna nt, 97.4%, while there were no pregnancies at all with low scores. Absent or reversed diastolic flow wa s not associated with pregnancy either.

- n another study using a modified score, high scores led to more than 85% pregnancies, and int ermediate ones to less than a third.
- n a study from Erbil (Zanco J Med Sci, 2022), a high pregnancy rate was linked to an endometrial thick ness of 10–14 mm, a clear three-layer pattern, marked endometrial blood flow and a low uterine artery PI. The last two features gave 100% pregnancies in that sample.
- n a study of ICSI and frozen embryo transfer cycles, the score separated cycles that led to pregna ncy from those that did not well: sensitivity was about 90% and specificity about 89.5%. In IUI cyc les, the overall score and uterine artery PI performed best.

Pregnancy rate at the maximum and at low scores in the study by Khan et al. (2016).

What the score does not do

hresholds vary from study to study, and the samples are mostly small and varied, so the score cannot give a hundred per cent prediction. It helps choose the strategy and timing: whether to transfer the embryo n ow or adjust endometrial preparation first. It is not a ban on transfer and not a substitute for clinical judgem ent.

A separate measure: resistance in the spiral arteries

Alongside the main score, we assess the resistance index (RI) in the spiral arteries of the endometrium, tak ing the cycle day into account. It is lowest in the mid-luteal phase, when the “implantation window” pens. In one study, the mean RI in fertile women at this time was 0.48 ± 0.08, while in unexplained in fertility it was higher, at 0.54 ± 0.07. There are no single generally accepted reference values, so this is a supporting measure and is not included in the overall score.

Mean spiral artery RI in the mid-luteal phase in fertile women and in unexplained infertility (mean ± standard deviation).

ow we use the score at Ekstramed

The clinic’s doctors adapted the score for everyday work and wrote their own calculator, as no ready -made tool existed. It:

- calculates the overall score automatically and shows straight away how to interpret it;
- works out the cycle day from the scan date and the first day of the period;
- assesses spiral artery RI separately according to the cycle phase and indicates whether the scan fa lls within the implantation window;
- roduces a report, either a full one with a table or a short one with the key findings only;
- rints the report on A4 or saves it as a PDF.

The calculator runs right in the browser without an internet connection, so patients' data are not sent any where. It is a supporting tool for the doctor: decisions are always made on the basis of the whole clinica l picture.

Frequently asked questions

Do I need to prepare in any way? No. It is a standard transvaginal ultrasound with Doppler, carried out on t he day set by your fertility specialist, most often before a transfer.

Does a low score mean the transfer will be cancelled? Not necessarily. The score is a reason to discuss wi th your fertility specialist whether to transfer the embryo in this cycle or to improve endometrial preparatio n first.

Does a high score guarantee a pregnancy? No. It means conditions in the uterus are favourable, but the outcome also depends on the embryo and on many other factors.

You can have the endometrium assessed before transfer with an ultrasound with Doppler at Eks tramed; the preparation programme is chosen by a fertility specialist.

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his article is for information only and does not replace a consultation with a doctor. Treatment is deci ded by a doctor after an examination.

Sources:

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